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JANUARY/FEBRUARY 2005

Grapevine trunk diseases in California

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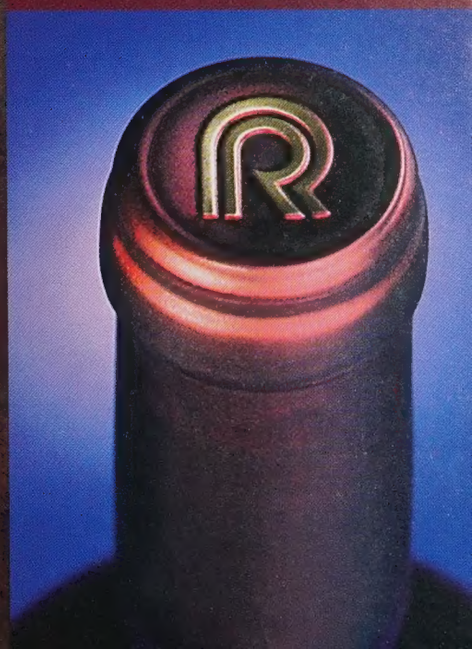

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COVER PHOTO: Cuvaison Winery's new JLB 20 HL basket press (capacity is 2.2 tons of pomace from a six-ton fermentor). Photo by Willy Herzig.

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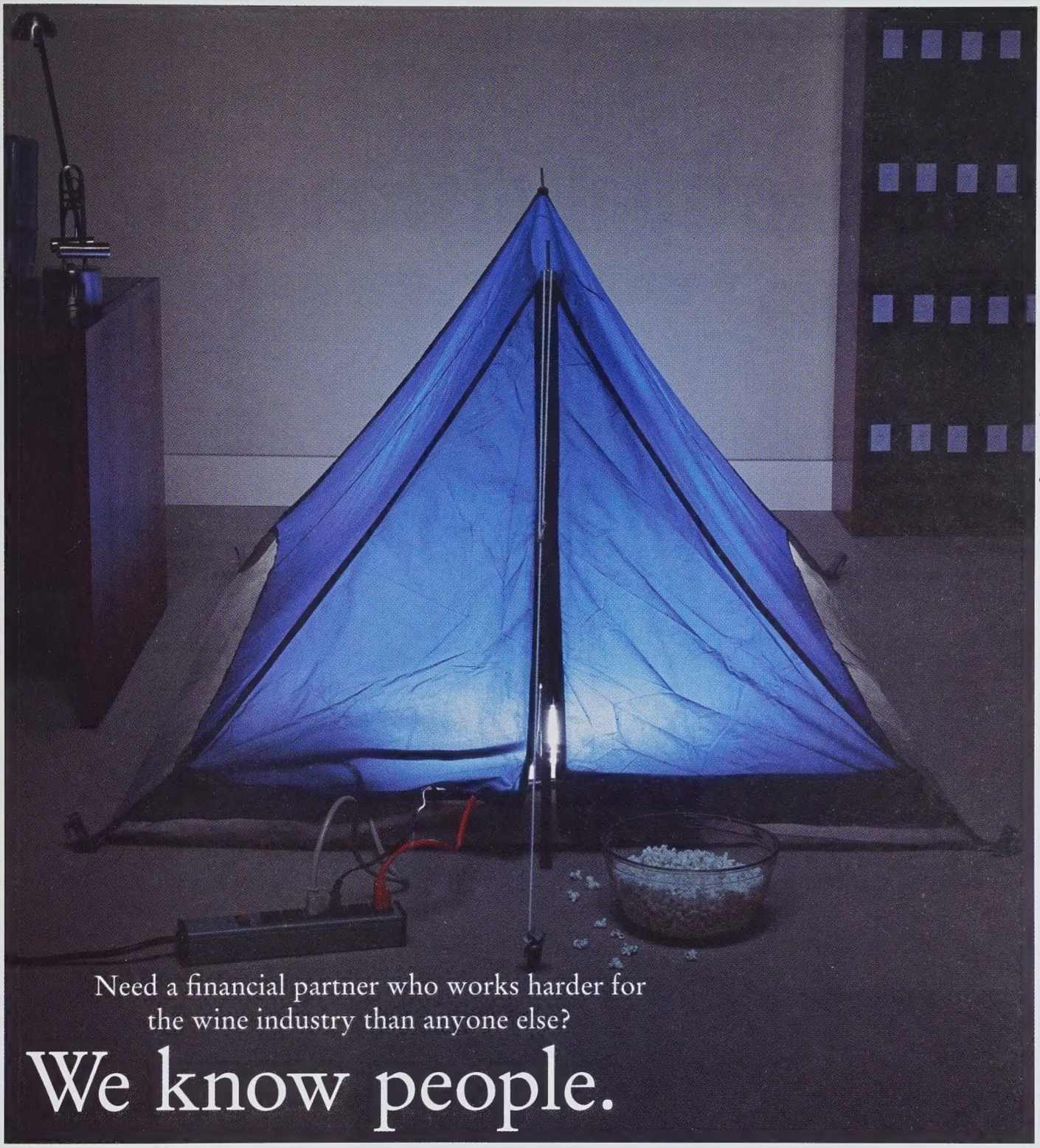

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RESEARCH UPDATE

Grapevine trunk diseases in California

BY W. D. Gubler, P. E. Rolshausen, F. P. Trouillase, J. R. Urbez, T. Voegel
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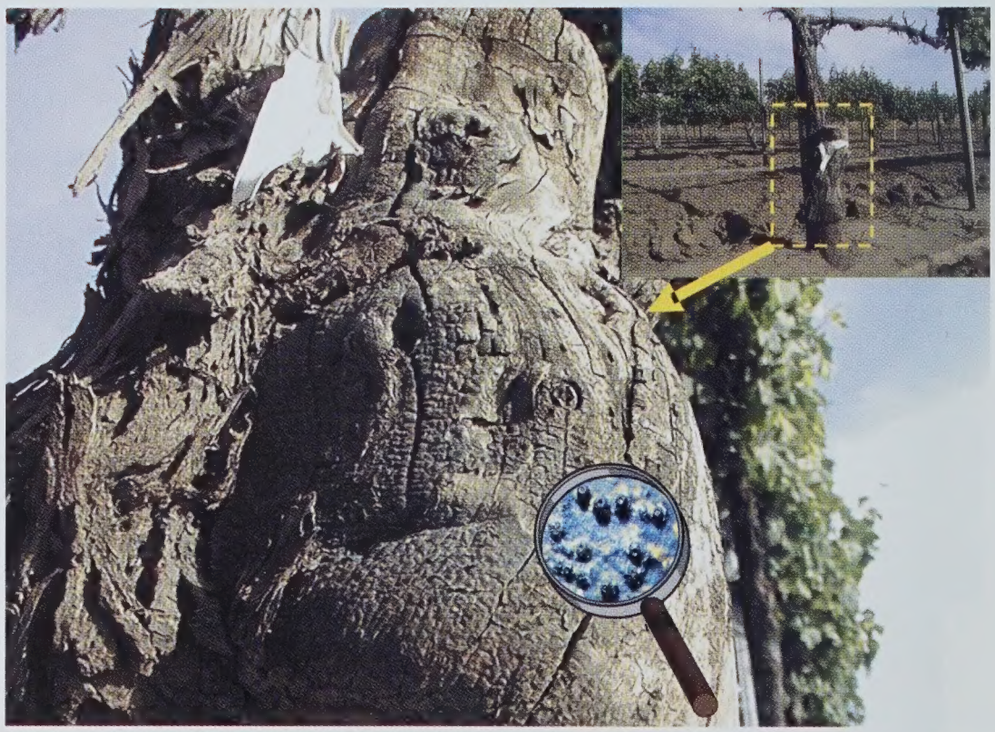

Figure I: Fruiting bodies (perithecia) of *E. lata* on a grapevine previously grafted for variety change. The large pruning wound favored formation of *E. lata* perithecia on the dead trunk of the old variety.

Grapevine trunk diseases are responsible for significant economic losses to the wine industry worldwide. Symptoms of these diseases include dead spurs, arms, and cordons and eventual vine death due to canker formation in the vascular tissue. In Eutypa dieback, deformed leaves and shoots occur as the pathogen invades spur positions. As cankers develop, yield reductions occur due to the loss of productive wood. The impact of grapevine wood diseases can be significant in older vineyards, and usually becomes more severe as vineyards become older.

Eutypa dieback, caused by *Eutypa lata* was originally thought to be responsible for most canker development in California vineyards. However, recent findings have highlighted the importance of other fungi involved in the death and decline of grapevines in California. In this regard, *Botryosphaeria* species have also been recovered from cankers, and were determined to be the main cause of canker diseases in some California vineyards.

Recent research has also indicated the occurrence of several new fungal trunk disease pathogens of grapevine belonging to the family Diatrypaceae (the same family as *Eutypa*). These include *Eutypa leptoplaca, Cryptovalsa ampelina, Diatrype* species, and *Diatrypella* species. We will present current information on the epidemiology and control strategies of fungal organisms responsible for grapevine spur, cordon, and trunk dieback in California.

Figure II: Black stroma bearing perithecia (fruiting bodies) of *E. leptoplaca* on dead trunk of big leaf maple collected in St. Helena, Napa County, CA.

Eutypa dieback

Eutypa dieback was responsible for a loss in net income for California wine grapes estimated to be over $260 mil-

lion in 1999. Many growers consider Eutypa to be the most significant disease of grapevines.

Typical symptoms of *E. lata* include formation of a wedge-shaped canker and stunted shoots with cupped, tattered, chlorotic, and necrotic leaves that are best seen in spring time. Foliar symptoms are due to toxins produced by *E. lata*. Differences in susceptibility of grapevine cultivars to infection have been reported, although no cultivars are immune. Cankers develop downward at a faster rate than toward the end of cordons and also increase in diameter over time. Extended infection of grapevines by *E. lata* leads to vine death.

Eutypa lata spreads to new pruning wounds by wind-driven and water-splashed ascospores released during rain events. Ascospores develop inside perithecia (fungal fruiting bodies) that form when the fungus enters its sexual stage. The sexual stage develops on dead wood, where masses of perithecia are produced in a black substrate referred to as stroma (Figure II). The sexual stage develops in regions that receive over 16 inches

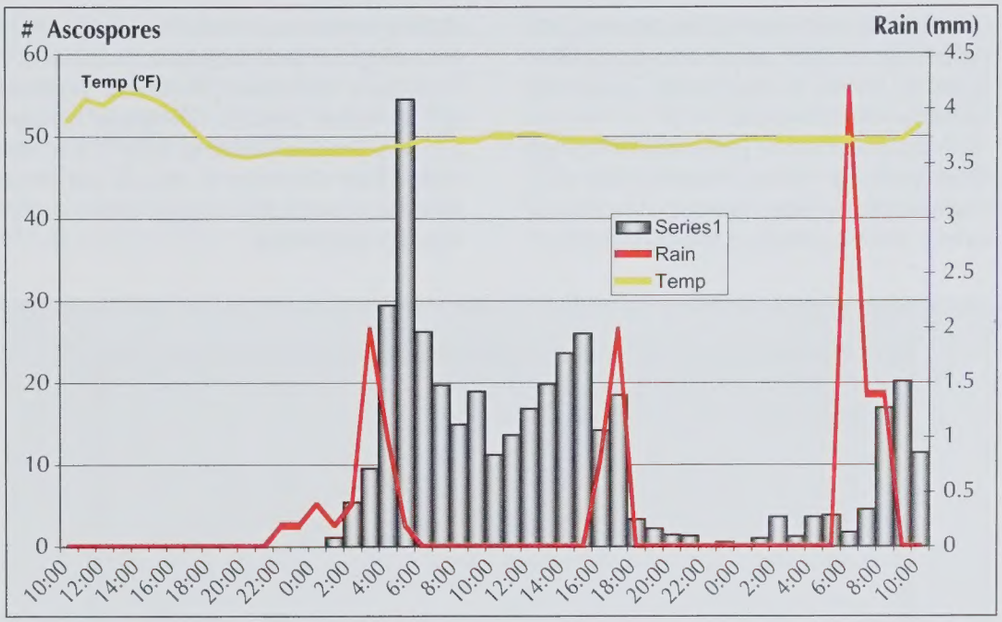

Figure III: Ascospore release curve of *E. lata* during a period of rainfall recorded in December 2001 in Davis using a Burkard spore trap placed around dead grapevine trunk bearing perithecia.

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of rain. It is common to find stroma and perithecia on old grapevines and other types of wood in the North Coast and Delta production areas.

Ascospores infect grapevines through fresh pruning wounds during the dormant season. They germinate, invade xylem vessels, weaken the plant by producing toxins and cause wood decay by excreting cell wall degrading enzymes.

Eutypa lata also produces asexual spores called conidia. These are formed inside pycnidia (another type of fruiting body) that develop on wood, but these conidial spores do not play a role in disease epidemiology.

Figure IV: Typical wedge shape canker formed by *Botryosphaeria* in the cordon of grapevine.

In California, ascospore discharge of *E. lata* occurs from the first rain of the early fall until the last rains of the spring (Figure III). Ascospore discharge decreases significantly in late February and remains low to nil by early March (Figure IX).

However, ascospore release may occur during rains in March and April if they are preceded by several weeks of no rain and sunny, warm weather. Such releases may occur because perithecia are able to recover in productivity during the dry period, or because spores that would have been released in the winter months are released in the spring simply because they were not released in the winter. This scenario more often occurs in years when there is little rainfall during the winter months.

Ascospore release from individual perithecia may occur continuously for approximately 24 hours during periods of rainfall, starting a few hours after the onset of a rain (Figure IX).

Over 80 plant species around the world have been reported to be potential hosts for *E. lata*. In California, many of these species were found to be infected with *Eutypa lata* and bore perithecia producing ascospores in the vicinity of vineyards. We now know that these species serve as natural reservoirs of *E. lata* inoculum.

In the 1970s, grapevine, apricot, and *Ceanothus* were found to be natural hosts of *E. lata*. More recently we have identified kiwifruit, blueberry, and cherry to be hosts in California and they were shown to bear the fruiting bodies (perithecia) of *E. lata*.

Additionally, a recent survey identified almond, crab apple, and pear trees as new fruit crop hosts for *E.*

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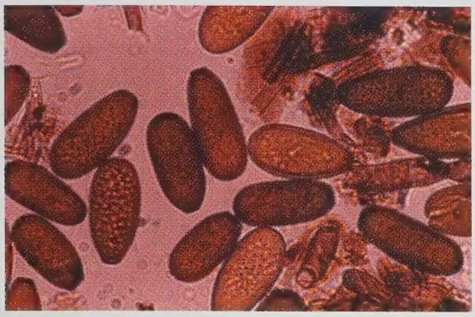


Figure V: Mature *Botryosphaeria obtusa* conidia.

lata, and showed the presence of perithecia of *E. lata* on several other new hosts in California including California buckeye, big leaf maple, willows, and oleander (Figure X).

Perithecia of *E. lata* were found to be particularly well established on dead branches of various willow species occurring along natural creeks and irrigation waterways.

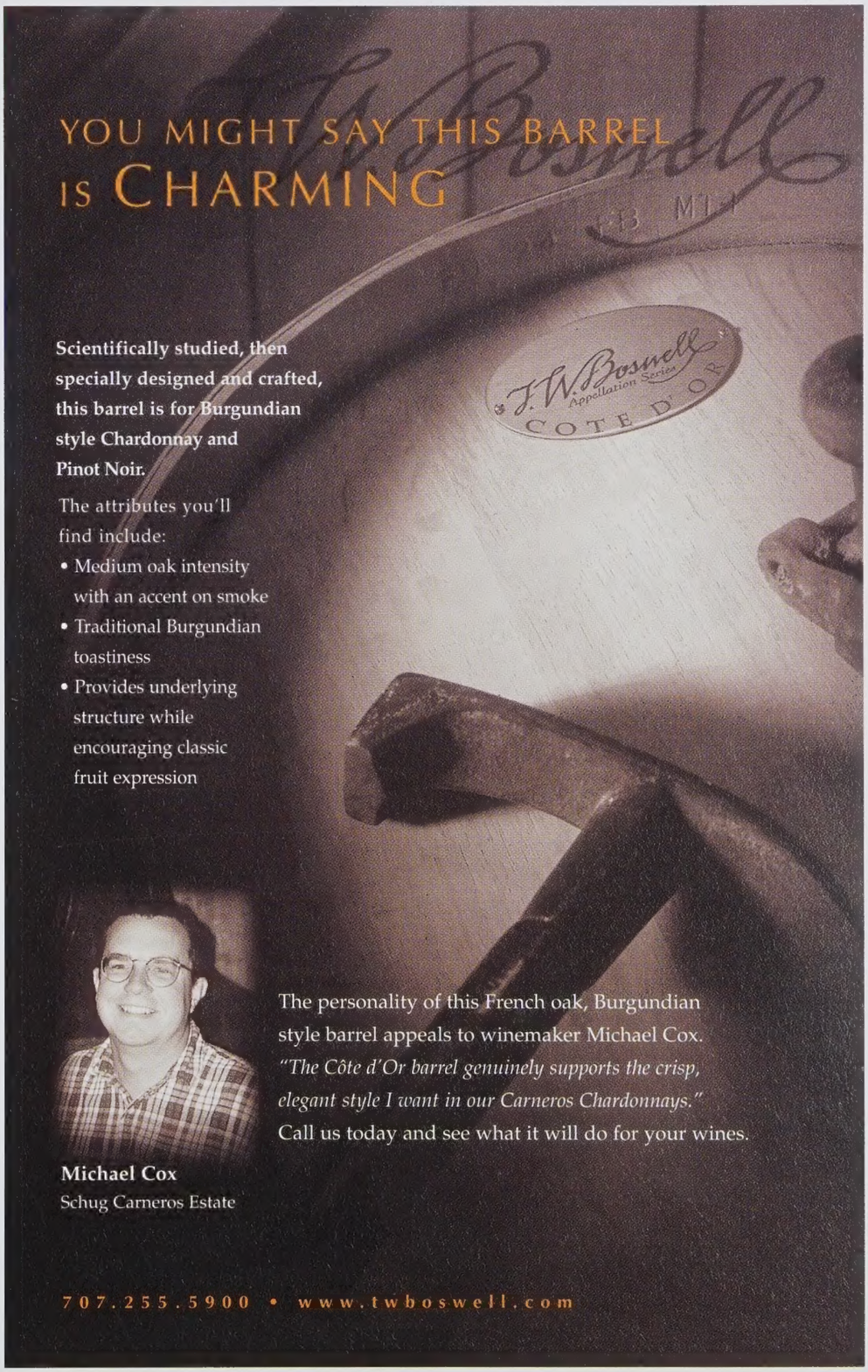
It appears likely that the flora surrounding vineyards is potentially a key factor in disease epidemiology and surely acts as an inoculum reservoir. Sanitation of the dead wood of potential hosts of *E. lata* in areas surrounding vineyards is advised in order to decrease the inoculum level. Sanitation can be accomplished by removing the infected tissues on plants that show disease. Generally speaking, this disease can be identified on other hosts by the black stroma that is produced (Figure II). By removing the stroma-infected wood and burning it, the number of spores released in winter can be reduced.

Surveys inside vineyards and apricot and cherry orchards have revealed an abundance of inoculum in plantings of approximately 20 years and older. Only a few perithecia have been found in almond orchards.

Perithecia of *E. lata* were found to be prevalent in vineyards or surrounds in the counties of Napa, Sonoma, Yolo, Sacramento, Contra Costa, San Benito, El Dorado, Mendocino, San Joaquin, Stanislaus, and Merced. Perithecia of *E. lata* were not found in Madera, Fresno, Kings, Tulare, and Kern counties.

Large amounts of viable inoculum were found in several old vineyards near Healdsburg, Sonoma County. Perithecia were particularly well-developed on vines that had been previously topworked for variety change. Stroma on those vines had developed on old wood below the grafting wound down to the union with the rootstock (Figure I).

While *E. lata* appears to be the primary Eutypa species involved in dieback in California, we have identified a second Eutypa species that can also cause dieback in grapevines (Figure XIII). This species is *E. leptoplaca*, a slower growing fungus in culture but with the capability to do the same kind of damage as *E. lata*. This new fungus occurs in the North Coast but seems to be more limited in its distribution.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It is our opinion after this study that even though *E. lata* and *E. leptoplaca* ascospores can travel over considerable distances and cause disease, Eutypa dieback is primarily a disease of local origin, developing in the vicinity where the ascospores are released.

Control

Disease management should include removal of the dead parts of grapevines and other host plants because of the potential risk of increased inoculum. We currently have no proof that sanitation will reduce the disease level in vineyards, but it seems appropriate if local production of inoculum is considered to be a key to disease development.

Figure VI: Mature *Botryosphaeria theobromae* conidia.

Grapevine pruning wounds can be susceptible to infection by *E. lata* for as long as seven weeks, but the length of this period varies with the time of pruning, size of the wound, and age of the wood pruned. Wound susceptibility to *E. lata* declined faster under higher (70° to 90°F) temperatures.

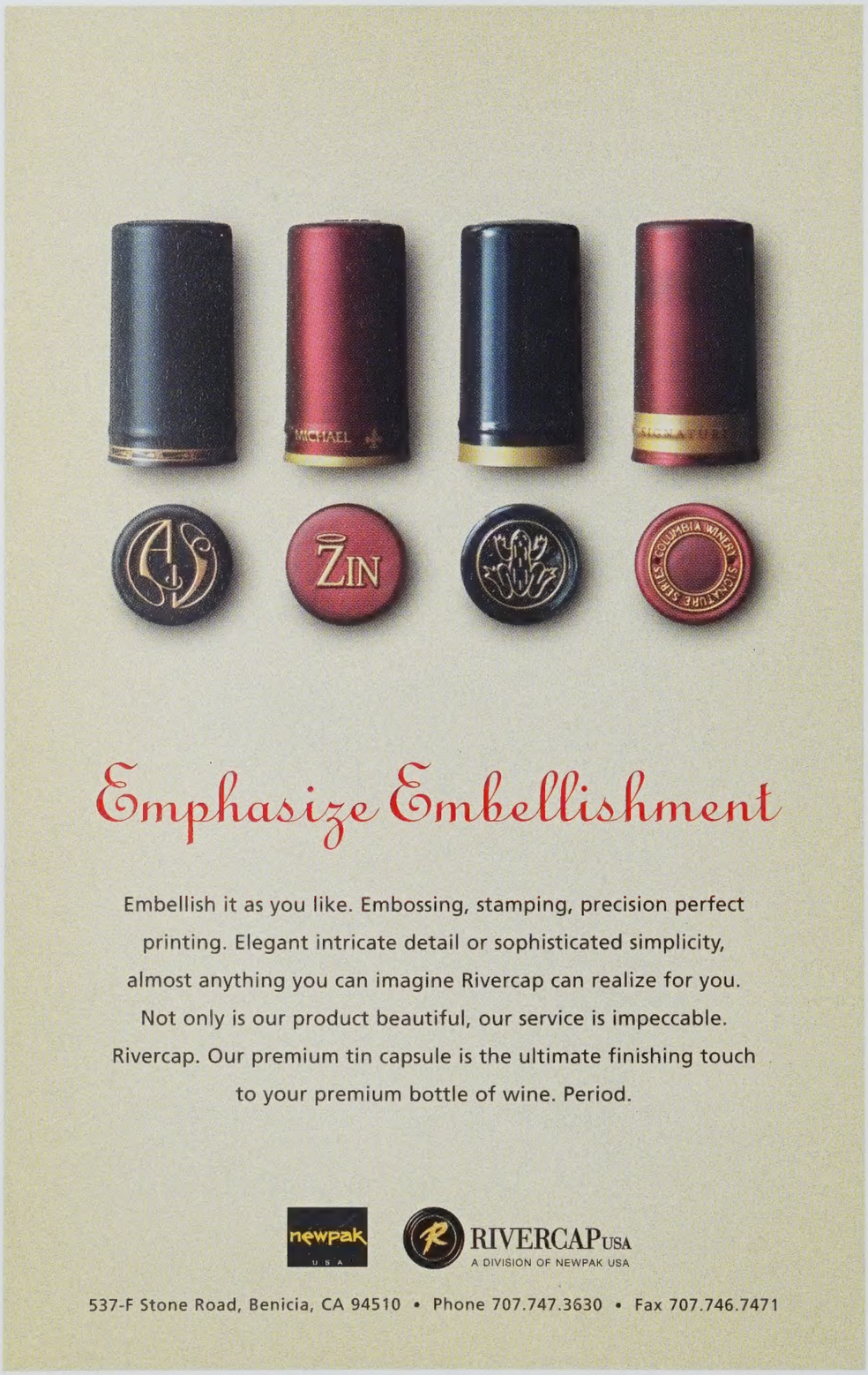
Wound healing occurs by deposition of polymerized phenolic compounds in the opened wood vessels, and concomitantly, natural establishment of a microbial population on the wound surface provide a natural "bio-barrier" to infection. These natural organisms (epiphytes), including *Cladosporium herbarum* and *Fusarium lateritium*, grow over the surface of a pruning wound and prevent infection by *E. lata* spores.

In a previous study, more than 1300 species of fungi and bacteria were found to colonize grapevine wounds in spring conditions.

Wound healing and colonization by epiphytic fungi and bacteria have been shown to occur more readily in the warmer spring months. Ascospore release, germination, and infection are also decreased during this time. Therefore, significant wound protection can be readily achieved simply by late pruning of vineyards.

Our work, and other research (Moller and Kasimatis), has shown that pruning wounds made in March heal more rapidly when compared to mid-winter. In our trials, late season pruning wounds that were artificially inoculated showed only approximately 10% of the infection rate of pruning wounds inoculated in mid-winter.

However, the large acreage of individual vineyards in California makes late pruning impractical for many growers who need to schedule their



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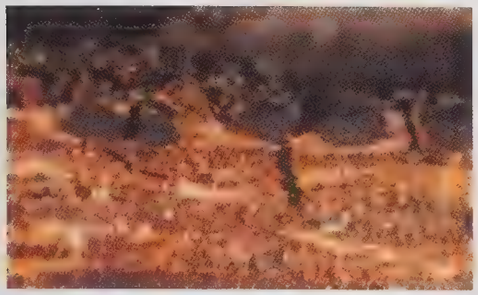

Figure VII: *Botryosphaeria obtusa pycnidia* found under the bark on the arm of an infected grapevine.

labor force throughout the winter months. One way to allow for more efficient late season pruning is to double-prune a vineyard. This involves going through the vineyard twice during the pruning season.

The first "pre-pruning" pass is made early in the season at which time the canes are simply trimmed back to a set length, usually 12 to 18 inches. This step can be performed mechanically or by a hand crew. "Final" pruning to spurs would take place late in the season (March) when the chances for infection are reduced.

By eliminating most of the brush early in the winter, final pruning should go more quickly, thereby allowing the final cuts to be made late in the season. Double-pruning is not appropriate for cane-pruned vineyards where long canes are retained each year.

Double-pruning creates an opportunity for wood pathogens such as *E. lata* to colonize wounds made early in the dormant season during pre-pruning. However, these infections will be eliminated during the final pruning step. We inoculated pre-pruning cuts throughout the winter months and showed that by March, *E. lata* had not grown downward more than four to five cm, which was well above the point where final pruning cuts were made.

Late pruning, either in a single step or as the final pass in double-pruned vineyards, is not a guarantee that Eutypa infections will not occur. Late spring rains can trigger ascospore releases and increase the risk of infection of newly pruned vineyards. However, late pruning certainly reduces the overall chances for infection and is a standard recommendation for disease control.

Disease management was historically achieved by treating pruning

Figure VIII: *Botryodiplodia theobromae pycnidia* found on old grapevine pruning wood left on the vineyard.

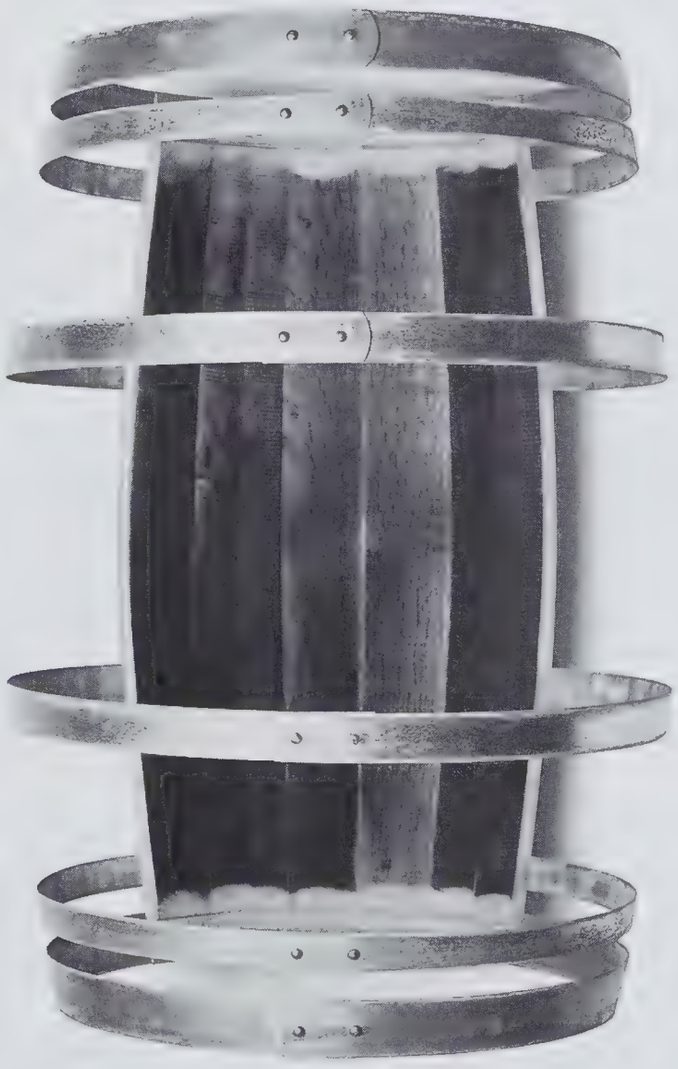

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Table I. Field trials in evaluating control of *E. lata* in San Joaquin and Yolo Counties in 2001 to 2002 and in Napa and San Joaquin Counties in 2002 to 2003. Pruning wounds were inoculated with 1000 ascopores of *E. lata* one and 10 days after application of test material.

	First timing of inoculation		Second timing of inoculation	
Treatments	Mean percent infection	Mean percent disease control	Mean percent infection	Mean percent disease control
Non-inoculated control	3	—	3	—
Inoculated control	64	—	32	—
Boron-free paste	61	4.7	19	40.6
C. herbarum	32	50	17	46.9
Boric acid	2	96.9	9	71.9
Bioshield	4	93.8	7	78.1
Biopaste	1	98.4	2	93.8

wounds with fungicides. Benlate® (DuPont de Nemours & Co., U.S.) was registered for *E. lata* for 30 years, and field trials showed good efficacy in preventing Eutypa dieback. However, long-term protection of pruning wounds was not achievable because the product did not persist in woody tissue for a sufficient time period. Therefore, multiple applications of Benlate would have been required to provide protection until pruning wounds were completely healed.

Benlate was withdrawn from the market in 2001 leaving growers without an efficacious chemical treatment to control *E. lata*. Topsin M was registered in 2003 under section 18 (emergency exemption) in California, but this product also belongs to the same class of fungicides as Benlate, a benzimidazole, and therefore has the same drawback (short-term protection) as Benlate.

Biocontrol agents have been tested as an alternative method for control of *E. lata*. *Bacillus subtilis*, *Fusarium lateritium*, and *Cladosporium herbarum* all showed some potential activity in limiting the establishment of the pathogen.

However, unlike chemical applications, which have an immediate protective effect, maximum protection from biocontrol agents requires colonization of the surface of the wound. Thus, there is a window of susceptibility after treatment, until the biocontrol agent is established well enough to prevent development of *E. lata* in the wounded tissue.

Biocontrols tested as alternatives to fungicides showed mixed success, but both *F. lateritium* and *C. herbarum* worked well when they were applied two to three weeks before infection occurred.

Boron was tested as an alternative control method because this element was proven to be effective at controlling other wood decay fungi. It is also used by growers as a fertilizer spray to improve fruit set. The application of boron as a fungicide may not yet be legal to control Eutypa dieback of grapevines, however, boron can be applied to correct nutritional problems.

We evaluated boric acid solutions and two boric acid-based products as pruning wound treatments. These included biopaste (5% boric acid [wt/wt] in a polyvinyl paste) and bioshield (5% liquid boric acid [wt/vol] plus a spore suspension of *Cladosporium herbarum*).

Boric acid reduced ascospore germination and mycelial growth of *E. lata* under controlled conditions in the laboratory, and the boron-based products yielded excellent disease control on artificially inoculated grapevines in both field trials and lab studies in comparison to *C. herbarum* and boron-free paste treatments (Table I).

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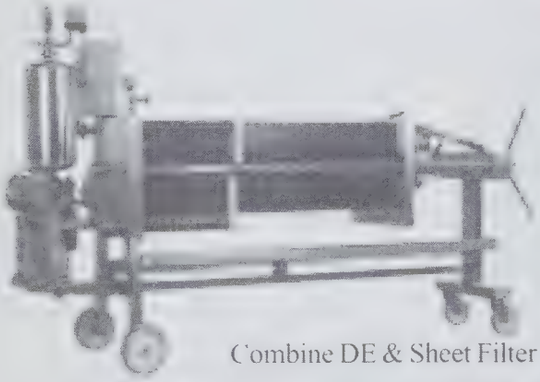

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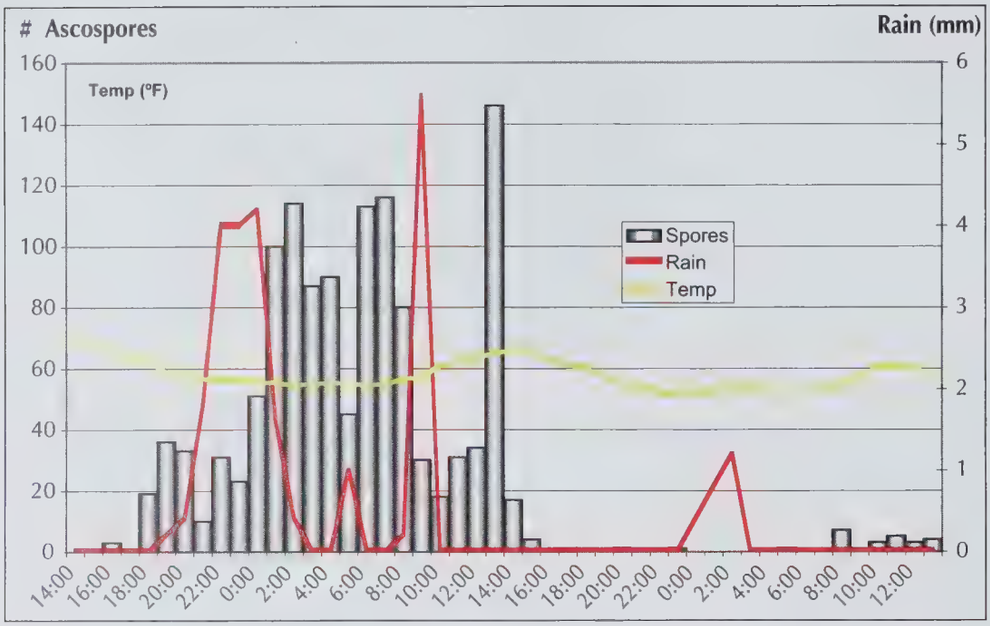


Figure IX: Ascospore release of *E. lata* recorded on the 12th, 13th and 14th of April 2000 in a vineyard in Healdsburg, Sonoma County, CA, with rainfall and temperature data. Ascospore release occurred for 24 hours during the rainfall period.

However, in one observation, the bud located at the first node below the pruning wound failed to push following treatment with liquid boric acid. This effect was also reported in peach and nectarine orchards sprayed with toxic amounts of boron-based fertilizers. Mechanisms involved in bud failure are not understood, and the economic impact has not been assessed. However, we do not recommend liquid boric acid for Eutypa dieback control.

Treatment of pruning wounds with boron-based products offers an effective, economical, and environmentally-safe management strategy to control Eutypa dieback in vineyards. However, formulations have to be optimized in order to increase control over longer time periods on the surface of pruning wounds, and to limit possible effects on bud failure of grapevines.

We believe strongly that if boron is used, it should be put in a paste so that it stays where it is placed.

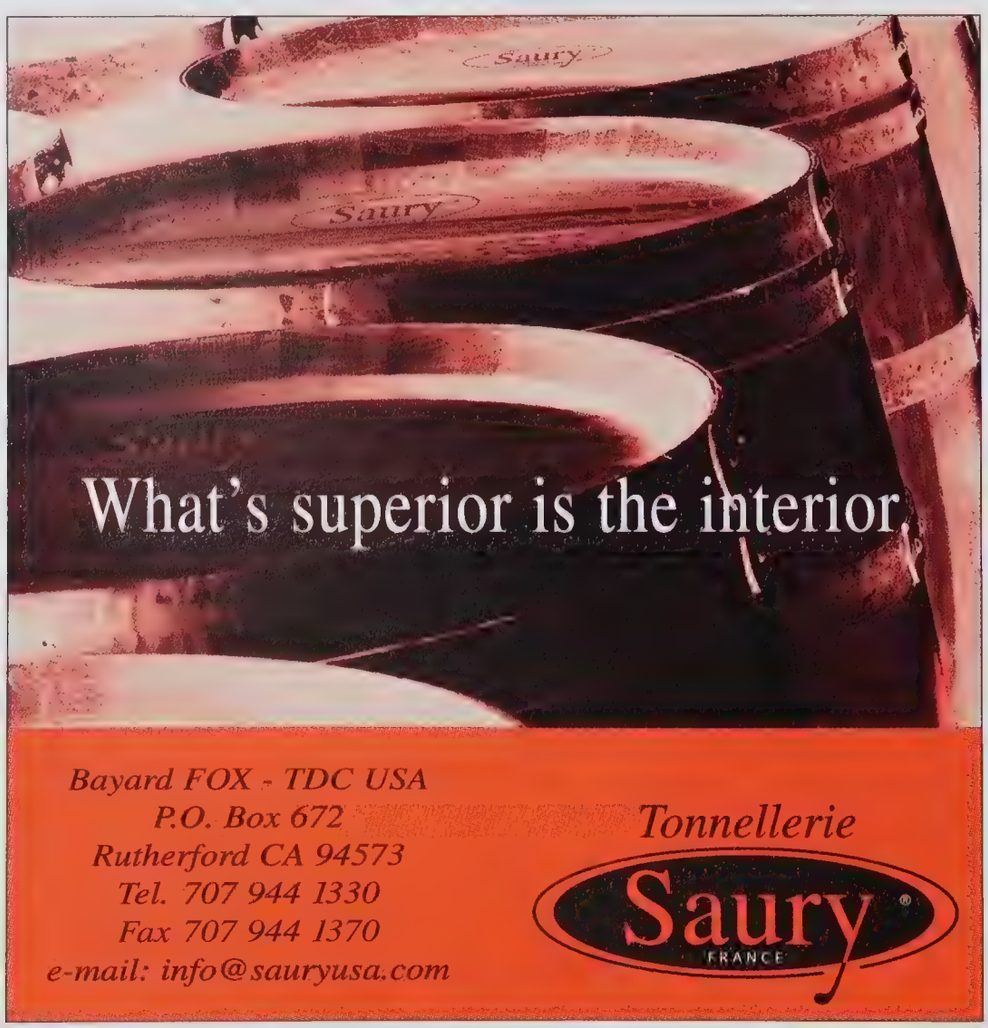
In earlier studies, soaps also provided good protection of pruning wounds against *E. lata*. However, most soaps, including dishwashing detergents, were phytotoxic. One laundry detergent, Dreft, not only provided excellent control of *E. lata*, but has never shown any phytotoxicity. This detergent, when used at 30% aqueous suspension (wt/vol), provided excellent disease control.

Further fungicide testing is underway, and we are trying to convince the chemical industry that Eutypa control products are worth registering for California viticulture.

BOTRYOSPHAERIA canker diseases

"*Botryosphaeria* canker disease" of grapevine is a wood disease caused by as many as four different *Botryosphaeria* species in California. Although it is well accepted that some *Botryosphaeria* species have been shown to be the causal agent of canker diseases of various crops and woody plants in California, the importance of these fungi as pathogens of grapevines has been largely ignored throughout the state.

Various species of *Botryosphaeria*, causing different symptoms, have been reported in the last decade as pathogens on grapevines in the U.S., South Africa, Australia, France, Italy, Portugal, Egypt, India, Mexico, Chile,



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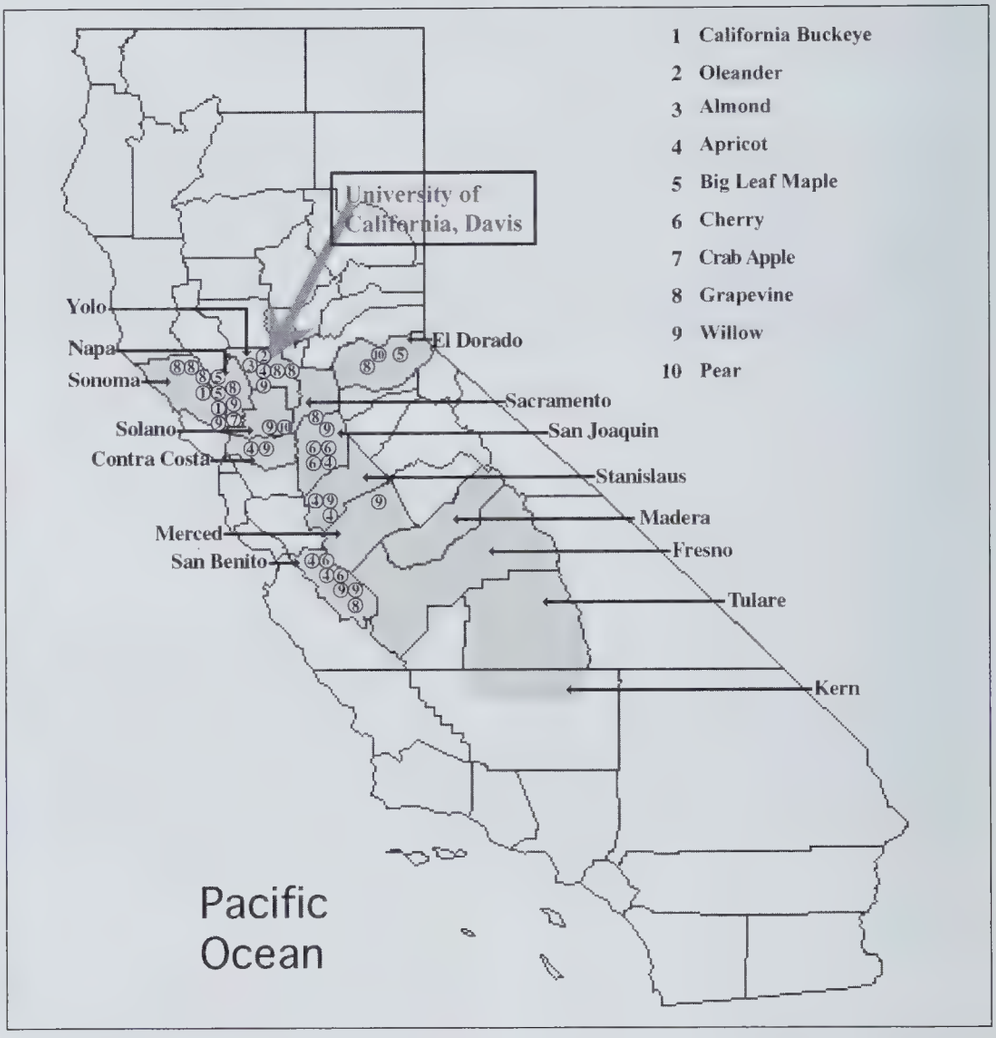

Figure X: Geographical area and new hosts of the pathogen *E. lata* in California. Survey was conducted in 2002. Areas represented in gray correspond to the areas that were surveyed.

and Brazil. In California, wedge-shaped cankers caused by *Botryosphaeria* can be found on vines 10 years old and older, especially where large pruning wounds have been made in retraining vines.

For several years, *Botryosphaeria rhodina* has been known to cause wedge-

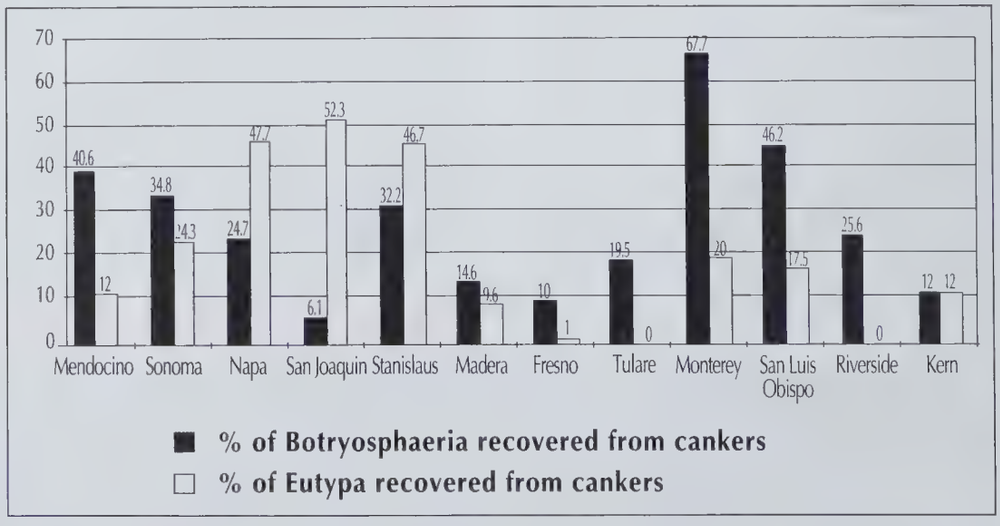

Figure XI: Relative occurrence of *Eutypa spp.* and *Botryosphaeria spp.* in California grapevine production regions.

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Bill Easton and wife Jane O'Riordan found their kilowatt usage dropped from 971 kWh a month billed last year to only 11 kWh a month this year. Jane opened her first electric bill to find, instead of hundreds of dollars in electric usage, only $11.24 for the month of March.

The winery is billed by PG&E for *net metering,* the difference between what they produce and what they use. "Once the system was installed and connected to the PG&E grid, the winery electric meter began running backwards! The cost for this type of system is reasonable when you consider the rebates and tax advantages. We expect that the system will have paid for itself in 3 years," said Jane O'Riordan.

By investing in their own solar system and becoming power producers, wineries and vineyards are taking control of their electric rates. Since the energy crisis of 2000, PG&E raised rates to pay for rolling blackouts and mismanaged energy purchases. Now businesses have an alternative to skyrocketing electrical rates by investing in their own solar systems.

Premier Power installed a 14.4kW system on the winery to take care of approximately 80% of the winery and tasting room buildings, using GE Energy 165 watt panels and Sharp Sunvista inverters. The modules are mounted on a south facing roof, which affords the best exposure, and cannot be seen from the road. The inverters are mounted inside the winery building, making it easy to monitor the production of electricity. These systems come with a 25-year warranty and last for over 30 years.

Just think, you can lock in your electric rates now and ignore those average 6.5% rate increases that the electric company charges each year (see chart). Currently the California Energy Commission (CEC) and PG&E (Self Gen Program) offer rebates which can pay up to 50% of the total cost of the solar system. What does that mean to you? If your needs are for a solar system of 30kW or less, the CEC will pay $3.20 a watt to help pay for your solar system. For wineries with higher usage needs, the Self-Gen Program will pay $4.50 a watt, or up to 50%, of the cost of your solar system.

In most cases, businesses try to install a system that will take care of most of their electrical needs. If that is not possible, a smaller system that will take care of the higher tier rates, which can go up as high as $.26 a watt, is the best solution. Solar systems create electricity just when we need it the most, on those hot summer days when everyone is using their AC.

Clean, green, renewable energy from your **Premier Power** solar system will spare the environment from harmful CO_2, Sox, and Nox fossil fuel emissions that contribute to global warming, acid rain, and smog.

Dean Marks, president of **Premier Power**, pointed out, "these systems will pay for themselves within four to eight years; then it's free electricity which translates to money in the bank. In the case of Domaine de la Terre Rouge, their rate of return (ROI) equals 14.54% (see chart). Compared to other traditional investments — stocks 12.5%, real estate 11.1%, bonds 5.2%, and T-bills 3.7% — investing in a solar electric system can take the risk out of your investment. Generous state rebates, 5-year Accelerated Depreciation, and Federal tax credits combine to provide immediate positive cash for most solar electric installations. The environmental benefits alone make installing a solar electric system one of the best things a winery can do."

Integrating solar electricity into their energy mix, Domaine de la Terre Rouge is lowering their operating costs and reducing purchases of expensive tier rates of electricity. Domaine de la Terre Rouge is improving the health and the quality of life in Amador County, while contributing to sustainability and energy independence for California. With PG&E rates up 30% so far this year, solar becomes an even better investment.

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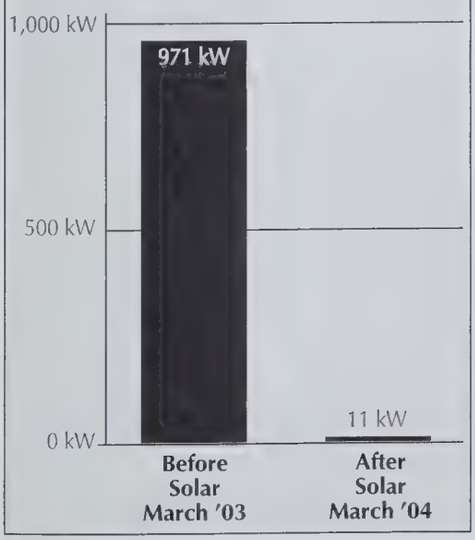

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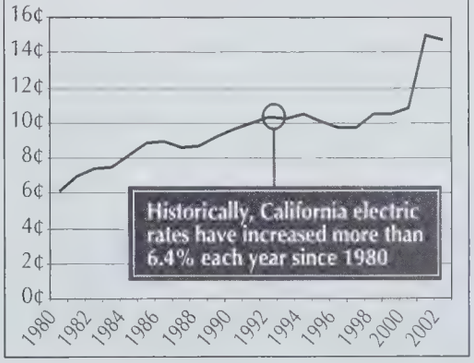
Net solar investment	**$ 24,310**
Electric bill	
Before solar – March 2003	971 kW
After solar – March 2004	11 kW
Total electric bill	$11.24
Return on investment (ROI)	**14.54%**

CALIFORNIA STATEWIDE WEIGHTED AVERAGE RETAIL ELECTRICITY PRICES FOR THE COMMERCIAL SECTOR



shaped canker symptoms in California. This species was previously known as *Botryodiplodia theobromae,* and the disease it causes was referred to as "Bot canker."

Fungi often produce both an asexual (imperfect) stage and a sexual (perfect) stage, and they may have different names. *Botrysphaeria rhodina* is the name for the sexual stage of this fungus; *Botryodiplodia theobromae* is the name of the asexual stage.

We prefer to use the name *Botryosphaeria* instead of *Botryodiplodia*. The disease is still known as Bot Canker. The fungus is now considered to be an endemic species in many vineyards in warm and hot climate areas in California.

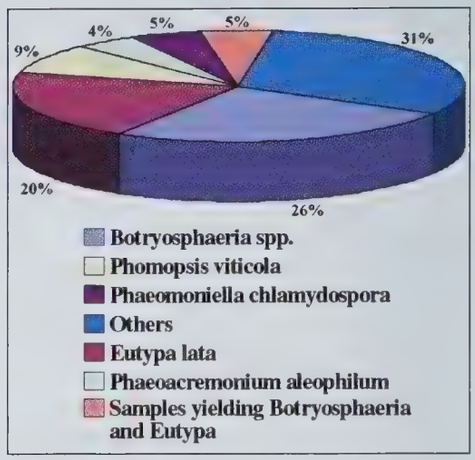


Figure XII: Comparison between percentages of cankers infected by *Botryosphaeria* spp. and other fungi in relation with grapevine dieback in California grapevines.

Typical symptoms caused by *Botryosphaeria* on grapevines in California are wedge-shaped cankers in the trunk and cordons (Figure IV) and dead spur positions. No foliar symptoms associated with *Botryosphaeria*-induced canker diseases have been observed in California grapevines. This is in contrast to other areas in the world where foliar symptoms have been observed on grapevines infected by different species of *Botryosphaeria* (*B. stevensii, B. obtusa* and *B. dothidea*).

The wedge-shape cankers caused by *Botryosphaeria* are visually indistinguishable from those formed by *Eutypa lata* or *E. leptoplaca*. All three fungi can cause cankers and can be detected in the vine at the same time. The best distinguishing characteristic is the presence of cankers and the absence of the stunted or chlorotic spring growth which is typical of infections by *Eutypa lata*.

Botryosphaeria spp. are wound pathogens entering the vine through fresh pruning wounds. Large numbers of *Botryosphaeria* conidia are exuded from black fruiting bodies (pycnidia) found on diseased vine parts, under the bark of cordons, trunks, and spurs (Figure VII) or on the residual pruning wood left in the vineyards.

In addition, we also know that many of these species cause disease on different hosts around the vineyards. The formation of numerous fruiting

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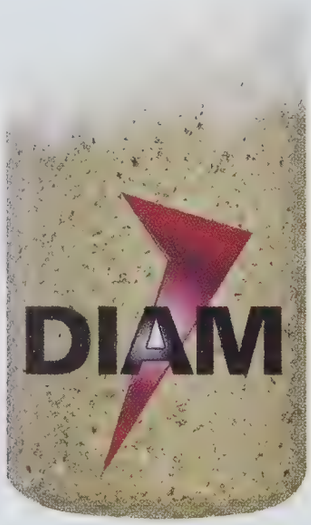

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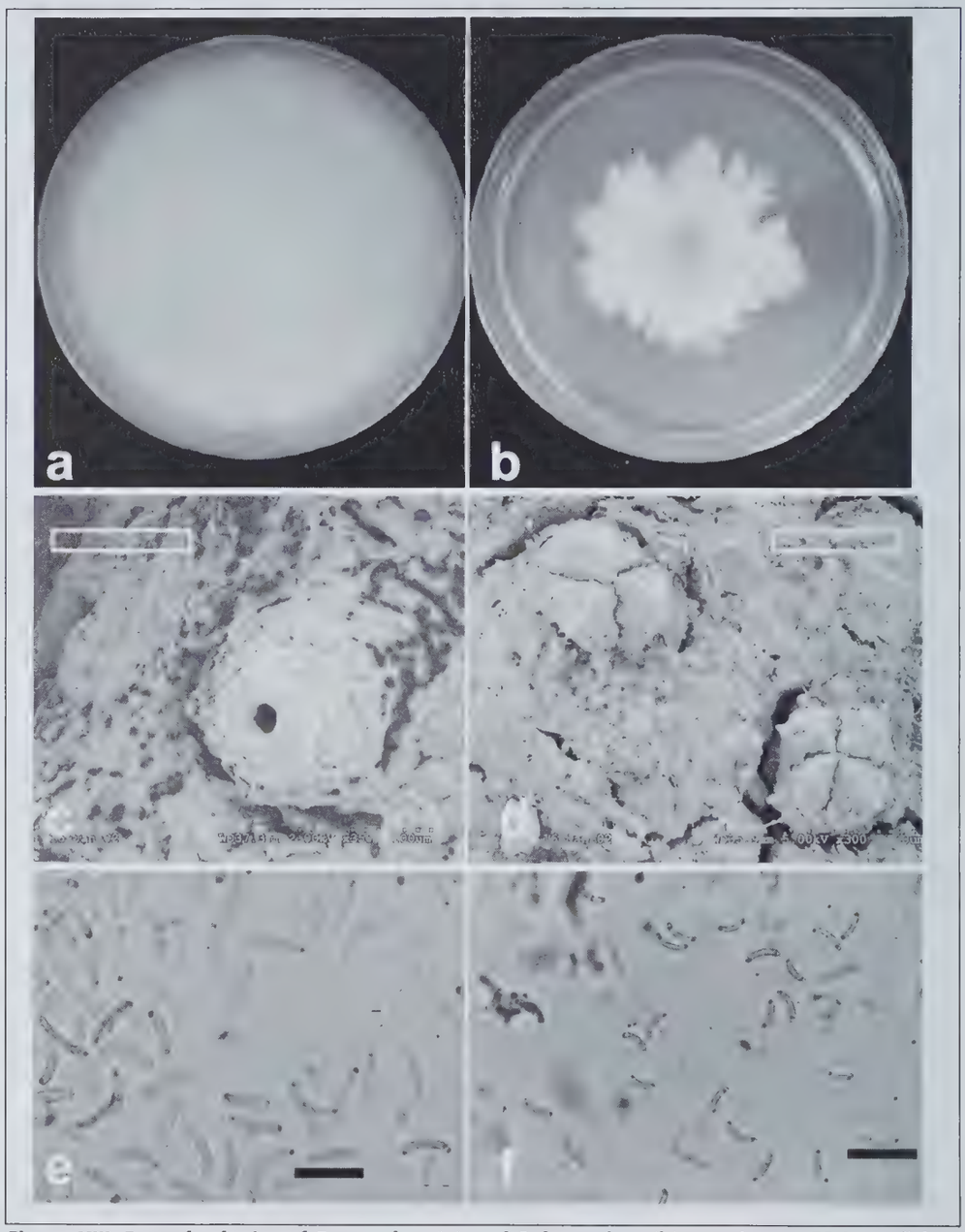

Figure XIII: Fungal colonies of *Eutypa lata* (a) and *E. leptoplaca* (b) growing on PDA-tet dishes incubated at 24°C under intermittent fluorescent lighting (12 h) for 22 d. Scanning electron microscope images of perithecial ostiola showing the roundish ostiole of *E. lata* (c) and the 3 to 4 sulcate ostioles of *E. leptoplaca* (d) (Bars = 100µm). Compound microscope images of the ascospores of *E. lata* (e) and smaller ascopores of *E. leptoplaca* (f) at same magnification (Bars = 10 µm).

bodies provides an excellent source of spores for further infections in the vineyard. Conidia may be easily distributed over the vineyard due to wind, or they may be waterborne in splashed drops from rain or sprinkler irrigation, but very little information is available concerning the *Botryosphaeria* disease cycle.

Like *Eutypa lata* and *E. leptoplaca*, the canker formed by *Botryosphaeria spp.* grows more rapidly basipetaly (or toward the root from the point of infection). The canker develops for several years in the trunks and cordons depending on where the infection was located. Death of the infected vine part occurs when the last live wedge of tissue is killed by the growth of the fungus.

Eutypa dieback and "Bot canker disease" decrease the life of the vineyard, reduce yields and increase production costs due to the application of control treatments, cultural practices to prevent infections, pruning out

of diseased tissue, and training new cordons and spur positions to replace those killed by the disease.

Field survey of Botryosphaeria

In a recent field survey (2003–2004), over 1,100 samples showing the typical wedge-shaped cankers were collected from 110 vineyards in 12 counties (Mendocino, Napa, Sonoma, Monterey, San Luis Obispo, Madera, Stanislaus, San Joaquin, Fresno, Kern, Tulare, and Riverside County). *Botryosphaeria* species were found in every grape growing area surveyed (Figure XV), showing that *Botryosphaeria* species are prevalent in cankered cordons and spurs in grapevines in California.

Botryosphaeria was the main fungus recovered from cankers in five counties: Mendocino, Sonoma, Monterey, San Luis Obispo, and Riverside. *Botryosphaeria* was also isolated in a higher percentage than Eutypa in Madera, Fresno, and Tulare counties (Figure XI). *Eutypa lata* was the main fungus isolated from cankers in Napa, San Joaquin, and Stanislaus County. In Mendocino, Sonoma, Napa, Monterey, San Luis Obispo, Stanislaus, and San Joaquin counties both fungi were occasionally isolated from the same canker.

It is important to note that *Phomopsis viticola* was the principal fungus found in cankers from Fresno and Tulare counties. We have yet to initiate a project there to evaluate the significance of this finding but plan to do so.

The fungi that cause Esca or black measles (*Phaeomoniella chlamydospora* and *Phaeoacremonium aleophilum)* were also isolated in a low percentage in this study. These pathogens produce different types of internal symptoms and were not a target of this work, but they reside in the same vascular tissue as the canker pathogens and thus will be isolated from time to time.

Four different *Botryosphaeria* species are associated with the wedge-shape canker symptom in California; *Botryosphaeria obtusa, B. rhodina (Botryodiplodia theobromae*), *Botryosphaeria dothidea* and an as yet unidentified *Botryosphaeria* species called *Botryosphaeria* sp1 (Figure XV).

It is also important to emphasize that only *Botryosphaeria rhodina (Botryodiplodia theobromea)* was recovered from cankers in the desert area of Coachella Valley. No other *Botryosphaeria* species or other wood invading, canker-causing fungi were isolated from the wedge shape cankers in this region. Only *Botryosphaeria rhodina* has been proven to cause a dieback disease causing a wedge-shape canker. The precise role of the other species isolated from cankers is still not clearly understood.

In the 2003–2004 survey, (Figure XIV), *Botryosphaeria* was isolated most often from Sauvignon Blanc (63.6% recovery from cankers tested) followed by Chardonnay (54.5%). Cabernet Sauvignon had the most cankers with *Eutypa* (57.7%).

Botryosphaeria was isolated in the same percentage from cankers of Perlette and Flame seedless (26%). Fewer cankers with *Botryosphaeria* were found in Thompson seedless (12.2%). Thompson Seedless appears highly susceptible to *Phomopsis viticola* and the pathogen was isolated from 29% of Thompson Seedless cankers tested.

Botryosphaeria was found in vineyards of all ages sampled (Figure XVI), but was isolated most frequently from cankers in 21 to 30-year-old grapevines (36.5%), followed by those grapevines that were 10 to 20 years old (33.4%).

The main fungi isolated from all wedge-shaped cankers collected in California have been *Botryosphaeria* (25.5%), followed by Eutypa (20%), *Phomopsis viticola* (8.7%), *Phaeomoniella*

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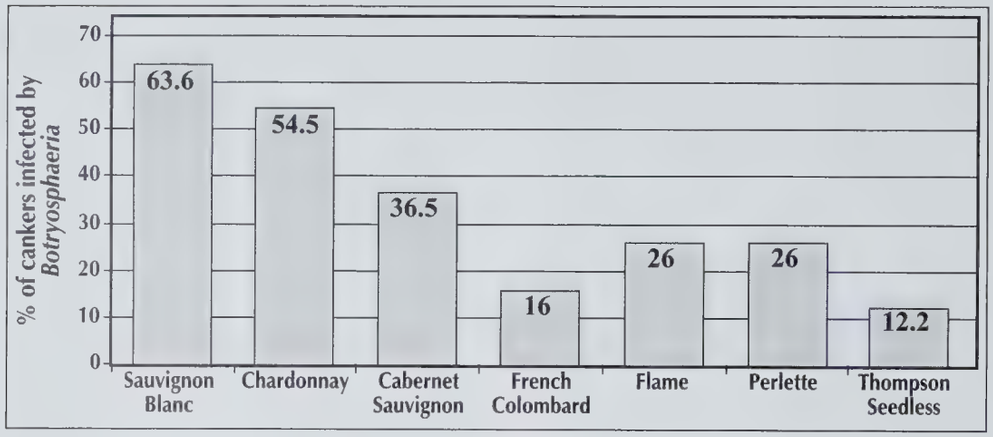

Figure XIV: % of cankers infected by *Botryosphaeria* in wine and table grape varieties in California.

chlamydospora (5.2%) and *Phaeoacremonium aleophilum* (4.3%) (Figure XII). However, the latter two pathogens do not cause cankers and were picked up in these studies as hitchhikers on wood showing symptoms of other cankers. In a parallel study, *Eutypa leptoplaca* was also isolated from vines in the North Coast but was not part of this survey.

Other wood decay fungi

Besides *Eutypa lata* and *Botryosphaeria* species, several other fungi were recovered from cankers of grapevines. These include *Phomopsis viticola*, *Phaeomoniella chlamydospora*, and *Phaeoacremonium aleophilum*. Others, such as *Diatrypella* sp., *Diatrype* sp., *Crytovalsa ampelina* and *E. leptoplaca* were also isolated from the margins of infected tissue.

Recently, another Eutypa species (*E. leptoplaca*) and *Cryptovalsa ampelina* were found to be pathogenic on grapevines as were species of *Diatrypella* and *Diatrype*. These fungal species all belong to the same family as *E. lata* and closely resemble *E. lata* in their spore shape, size, and by their appearance in culture (Figure XIII). These fungi also have been found commonly on various host plants in the vicinity of vineyards.

Eutypa lata and the other diatrypaceous fungi have the same morphological characteristics in culture including spore shape and color. It is apparent that over the last several years, *E. lata* was not the only pathogen being isolated from cankers. Not until this

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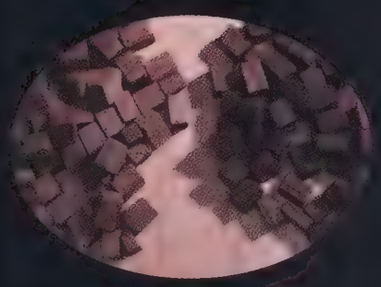

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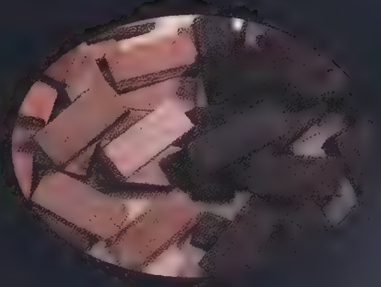

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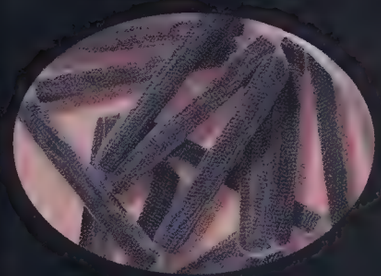

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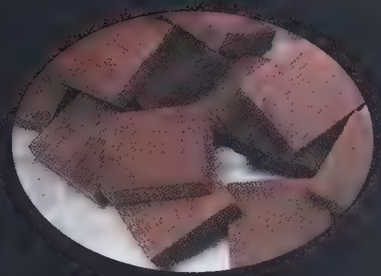

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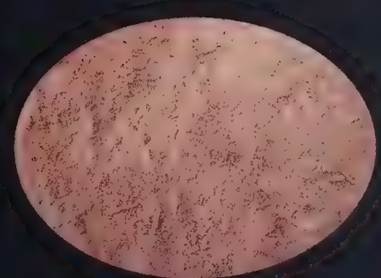

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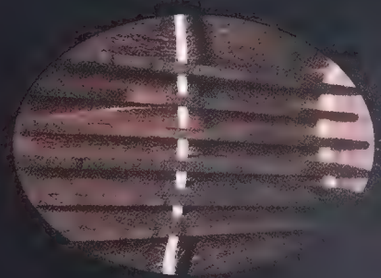

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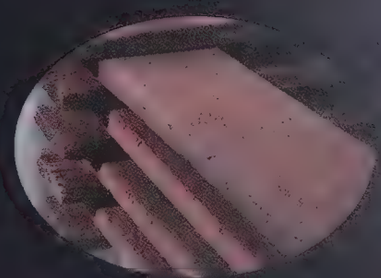

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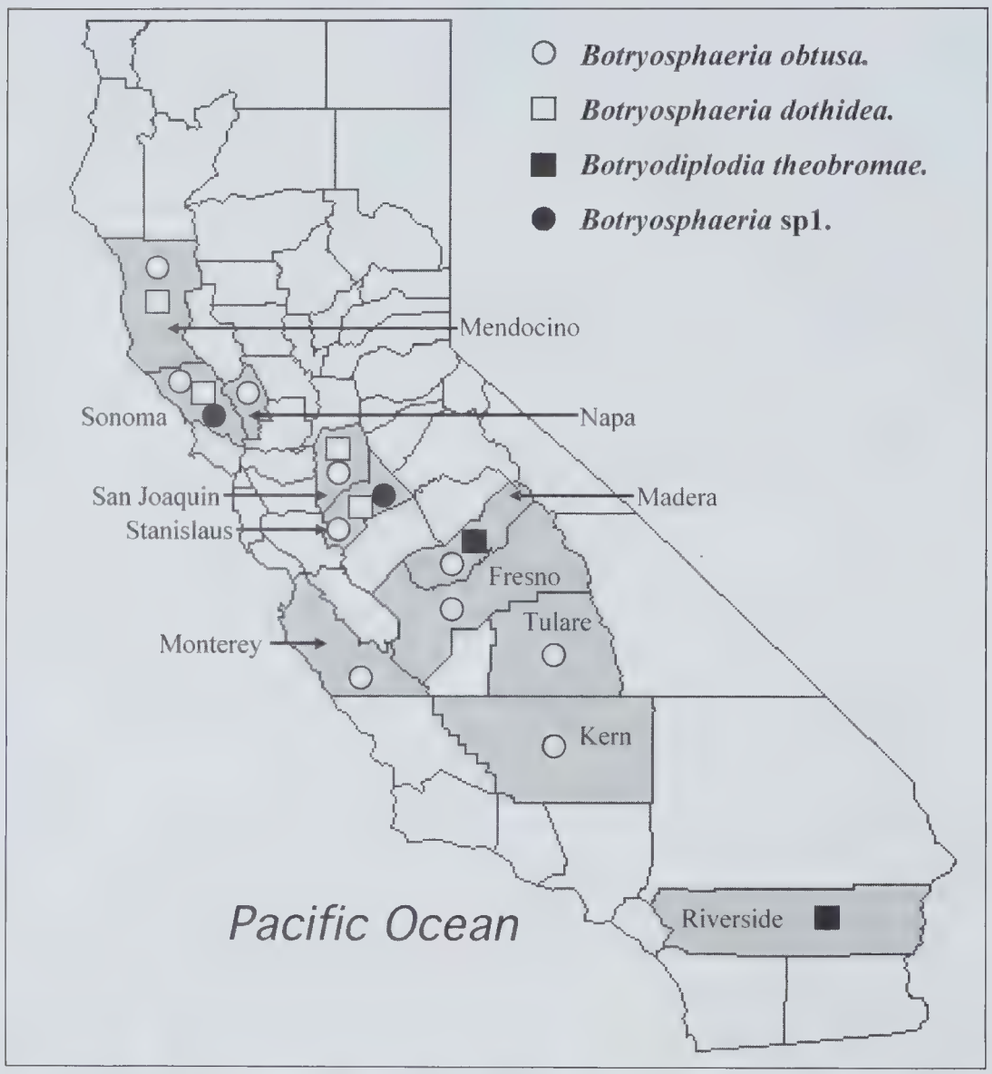

Figure XV: Geographical distribution of *Botryosphaeria* species found in the grapevine production areas in California during 2003 and 2004.

study did we realize that more than one pathogen was capable of causing the same type of disease.

Given these results, it is evident that *Eutypa lata* is not the only cause of grapevine canker diseases in California vineyards. More studies should be conducted to elucidate the impact of the different species of *Botryosphaeria*, and other fungi detected in cankers. The virulence of many of these species remains to be determined.

These recent discoveries have led to the conclusion that grapevine trunk diseases are more complicated than initially thought, and that a complex of fungi may be involved. Development of information regarding the biology, epidemiology and control of each of these fungi and diseases is underway. Nevertheless, we know that vineyard sanitation through the removal of infected parts of vines is highly advised, and where possible, sanitation of surrounding areas where other potential hosts of these pathogenic fungi reside. ■

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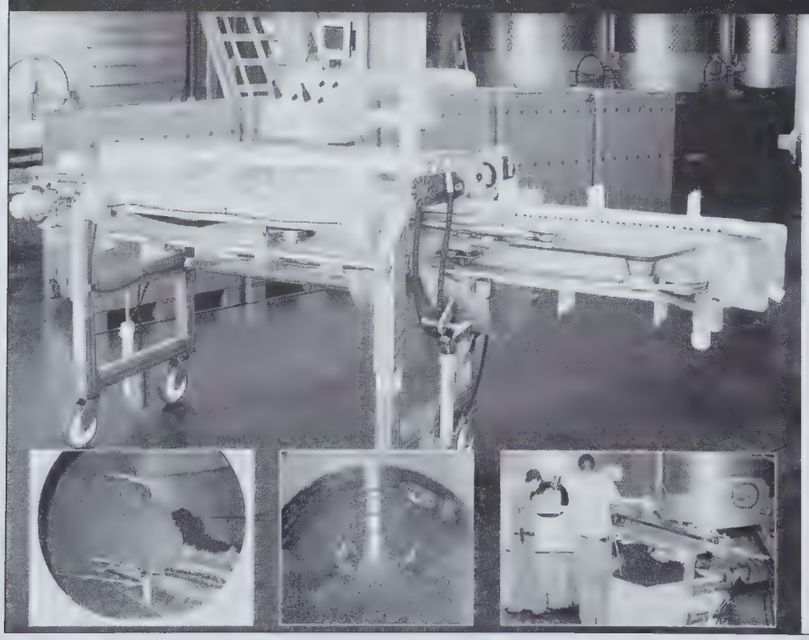

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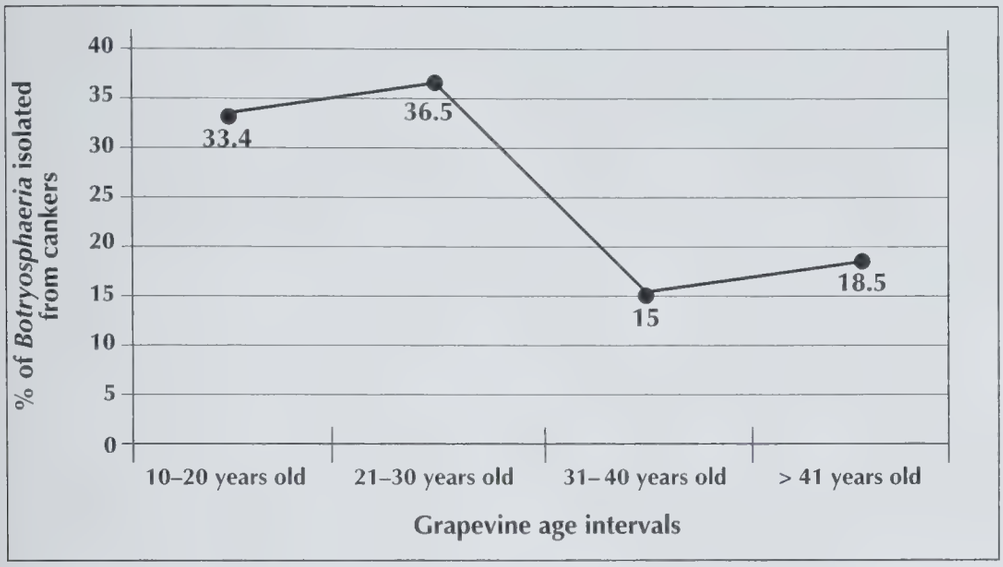

Figure XVI: Effect of vineyard age on the occurrence and incidence of *Botryosphaeria spp.*

Acknowledgements: We wish to thank the American Vineyard Foundation and the USDA Viticulture Consortium for partial funding of this work.

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Pruning without pain

BY Tina Vierra

Hand pruning remains the single largest expense in vineyard operations, though mechanization has had a significant impact. Unfortunately, repetitive, tiring hand pruning takes a toll on workers, causing pain and injury. Vineyard managers in New Zealand and California are looking for ways to reduce such injuries, and experts report that injuries can be avoided with a little bit of training and a lot of supervision.

In New Zealand, vineyard injuries have been rising. In the space of three years, claims to the Accident Compensation Corporation (ACC) — the government-run, no-fault compensation and rehabilitation scheme — have doubled and the cost tripled.

"Not all the rising toll can be accounted for by the considerable growth of the New Zealand grapegrowing industry," says New Zealand consultant Mark Preston-Thomas. "In Marlborough, a premier wine region that accounts for a third of vineyard injury claims, the ACC and industry stakeholders decided to do something about it."

Strategies to manage muscle fatigue were presented to 170 workers from Montana Wines' Fairhall Estate, the Marlborough Contractors Federation, and Marlborough Winegrowers early in 2004 at an injury prevention workshop organized by the three groups and Preston-Thomas.

Pruning injuries are usually caused or aggravated by work or activities that involve repetitive movement, sustained or constrained postures, or forceful movements.

Muscles and tendons can withstand fatigue and recover better if they are given a variety of tasks and regular rest breaks. Indeed, it may be the absence of variety and rest breaks that strains the muscles and tendons beyond their capacity for short-term recovery.

"We know that pruning requires good health and no arthritis," says Daniel Robledo (Santa Rosa Junior College, Santa Rosa, CA). "Employees working in repetitive tasks should be aware of this. If a task is too hard for a worker, he/she should stop doing that task and find an alternative one." If a worker is willing to admit a problem and has other skills, the company can find another available job for that worker.

The question arises whether it is legal to screen the health of vineyard workers prior to hiring them for pruning. Mary Fortune, Senior Loss Control Consultant for California's State Compensation Insurance Fund, says yes, within state guidelines.

"In California, an employer may require a pre-placement physical to determine if an applicant can safely perform the essential functions of the job and make the offer of employment contingent upon whether the person passes his or her physical," Fortune explains. "The employer is not allowed to know any medical details of the physical. The doctor would just make a determination to hire or not to hire based on the physical and the job description."

California vineyard managers report that repetitive-motion injury is less common among their pruning crews than other injuries. Most problems included cuts to fingers and hands, eye injuries from the canes, and even slips and falls on muddy vineyard grounds.

Robledo says that he hears from vineyard managers anecdotally that, with U.S. border restrictions tightening, younger vineyard workers are harder to find these days. Worker populations are aging, so productivity slows and the workers naturally tire sooner.

Jill Bunting demonstrates injury prevention techniques to pruning crew at Montana Wines, New Zealand.

A more serious problem, which vineyard managers are trying hard to address, is getting workers to actually report an injury.

"There was a time when complaints equaled termination," claims Glenn Alexander (Bacchus Vineyard Management, Fulton, CA). "Vineyard workers were too scared of losing their job to complain. They still are, to some degree. I believe it is a cultural issue and a language issue, to some extent, since some of our vineyard workers only recently arrived in the U.S. The only way to overcome this reluctance is to build mutual trust and respect with the workers."

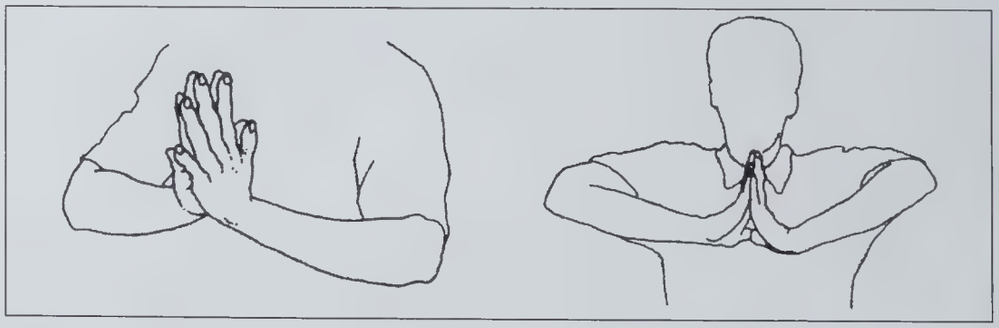
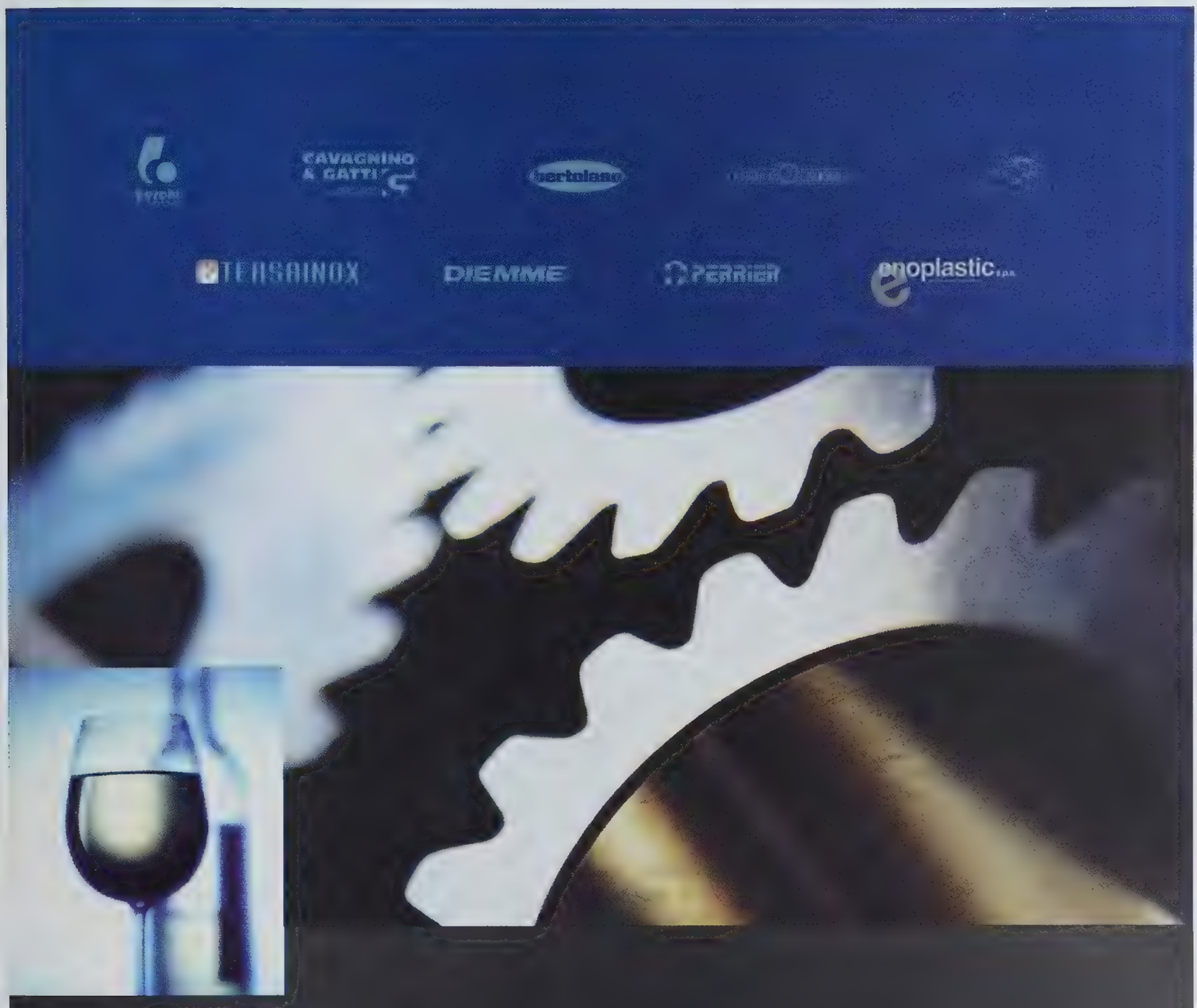


Figure I: The prayer position exercise

PWV thanks the following contributors for the original text and/or input to this article: Mark Preston-Thomas, ACC Injury Prevention Consultant, New Zealand; Jill Bunting, author of Body & Vine: A Pruner's Guide, *New Zealand; Daniel Robledo, Viticulture Program coordinator, Santa Rosa Junior College, Santa Rosa, CA; Frank Coster and Glenn Alexander, Bacchus Vineyard Management, Fulton, CA.*



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Another common complaint from vineyard managers, according to Robledo, is that if a company reports an injury claim to its workers compensation insurance provider, premiums rise. "We're being punished for reporting injuries, so of course, we are reluctant to report them," he says. "It's a huge flaw in the system."

The New Zealand workshop was run by occupational therapist Jill Bunting, who took workers through the equipment used in the vineyards and provided tips on reducing injuries.

Bunting was supported by New Zealand gym owner Jon Cunliffe, who told pruners how to prepare for work through body conditioning, non-workplace activities, and eating well. The usefulness of Cunliffe's presentation came as surprise to attendees as much of the information was completely new to them.

"I focused very much on being fit for work. Just as athletes train for the physical aspects of their jobs, pruners also need to prepare their bodies to be in the best possible shape," Cunliffe says.

The four workshop sessions of one-and-a-half hours each covered a variety of topics, including nutrition, clothing, warm-up and stretching exercises, specialized supports to prevent injury, and user-friendly equipment.

After positive feedback from the Fairhall Estate employees, it was decided to hold this workshop annually in Marlborough just before the pruning season.

Robledo has some experience with this type of workshop in California. "State Compensation Insurance Fund safety representatives gave pep talks to workers at my family's company, but I found that most, if not all, workers go back to old habits. Things went in one ear and out the other."

Alexander agrees, "That is why you need good supervision, good leadership from the vineyard management. Most of the time, pruners are left in the fields after the supervisor gives them the morning's instructions. The supervisor should stay or check on them frequently, specifically looking for signs of fatigue or injury."

Another issue is the piece-rate system, under which many pruners get paid for the work they do. Workers are encouraged to go flat out and pay inadequate attention to tired muscles. But if pruners stop briefly, at least every 30 minutes to do stretches and relax, their productivity actually increases and they can earn more," instructors at the New Zealand workshops told participants.

All of the California vineyard managers agree that piece-rate work should become a thing of the past. Pruners are far too prone to injure themselves when they put speed over quality and their own health. In extreme cases, some workers have had to be fired for lack of care for their own health or the quality of their work.

"Pruners lose the sense of quality work on a piece-rate basis," notes Robledo. "Quality is hard enough to control. Many companies have switched to hourly pay for pruning to obtain quality." Switching to hourly work also reduces conflicts

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between supervisors and pruners when supervisors point out poor cuts.

"The labor pool and management in New Zealand are very different from here in California," observes Frank Coster (Bacchus Vineyard Management, Fulton, CA). "I'm not sure that some of the recommendations, such as diet and the use of fitness centers, would be accepted by workers here."

Back and leg exercises have also been built into the daily exercise program at the Fairhall propagation unit in New Zealand, where nursery staff have been given exercises as part of normal daily work practice.

Opinion on the practice of having workers exercise to warm up is split among California vineyard managers. "My dad and I have pruned vines for a living since 1971, at our nursery, and in vineyards. We never warned up before pruning," says Robledo.

"I really believe there can be a system of physical activities that can reduce or eliminate injury in this area," Alexander reports.

"Exercises before beginning work are a good idea, but I doubt very many workers will take it seriously and continue doing it unless a supervisor is watching," says Coster. "It will help with liability issues if you can show that you at least instructed the crews properly."

The following sections are excerpted from *Body and Vine — A Pruner's Guide* by Jill Bunting; they have been supplemented with input from the California vineyard managers.

Tips for workers

Personal protection

- Make sure you have a good quality breakfast before starting work.
- Wear warm clothing in winter — thermal underclothes, boot liners, thermal socks, a hat and lightweight thermal gloves, rain gear for wet California winter conditions.
- Use sun protection in summer — hats, plus sun block on your face and ears and the backs of your hands.
- Remember that smoking deprives your system of the oxygen it needs and inhibits circulation to your fingers and toes.
- Stretch all the "high-use" areas of your body several times an hour, especially the forearms, back, and shoulders.
- Pay attention to your personal fitness.
- Drink plenty of fluids.

California vineyard managers agree with the nutrition points and fueling up the body before starting work.

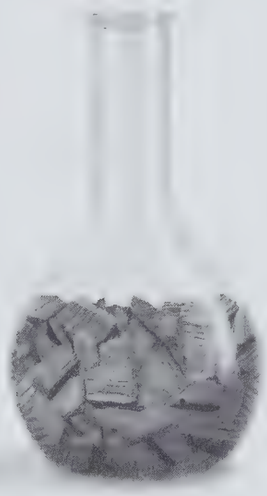
Robledo feels that worker teams would be reluctant to do warm-up exercises or stretch breaks, but Alexander says, "I would recommend scheduled, mandatory breaks with exercises if your crew faces a long pruning day or several days of pruning in a row. And supervisors should monitor the breaks."

Your workplace

- Keep workspace tidy and free of rubbish, which could cause falls.
- Have your breaks in wind-free areas to prevent body chill and muscle tightening.
- Report painful areas early to your employer — a timely day off, if heat

alchemy

alchemy: (n.) 1. An imaginary art. 2. A medieval chemical philosophy. 3. The seemingly magical power or process of transmuting something common into something precious.



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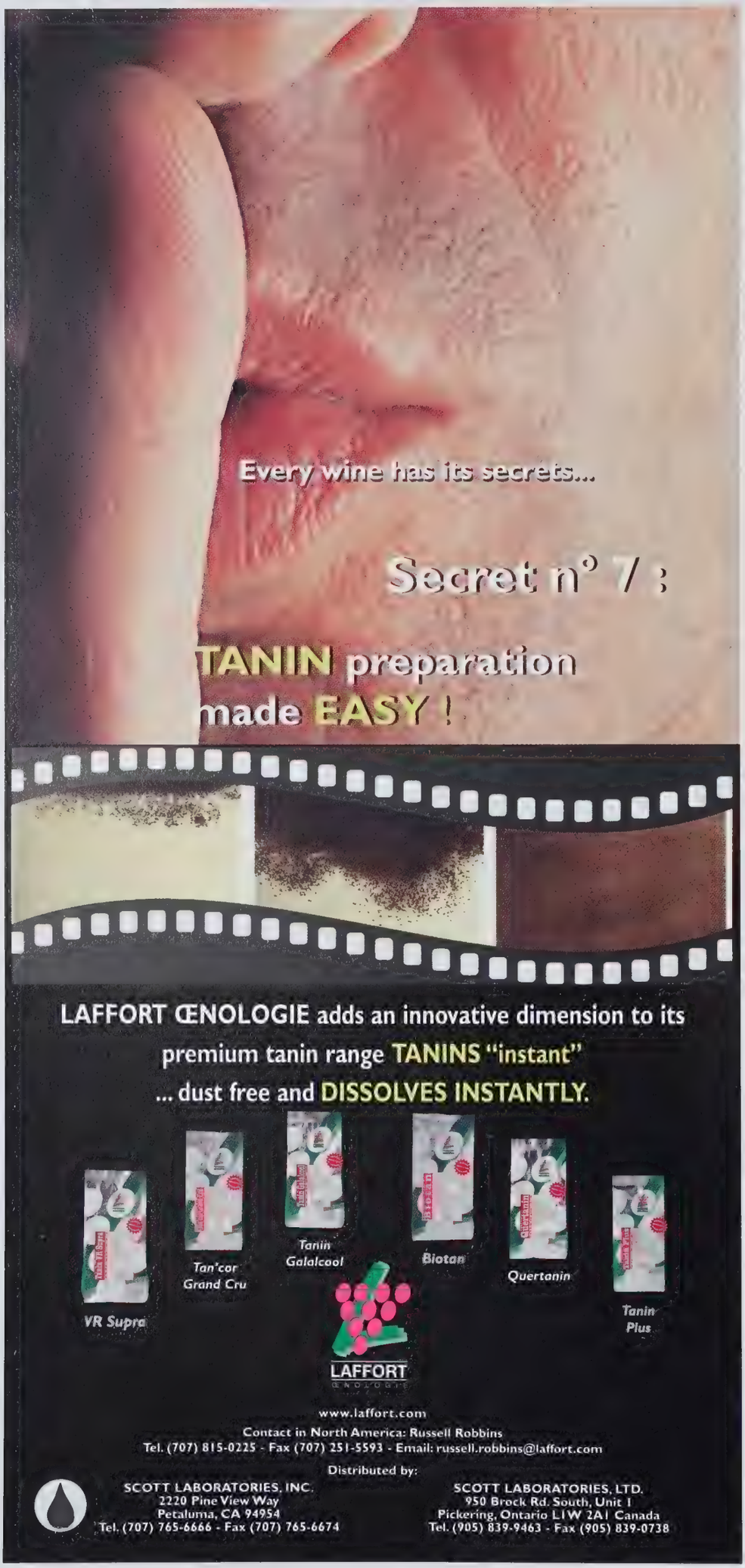


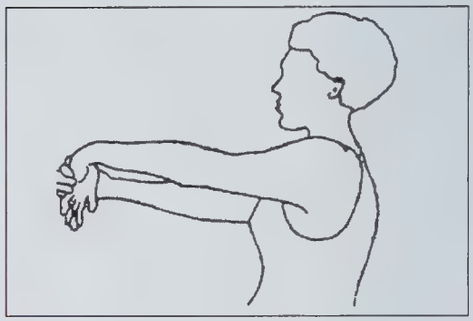


Figure II: Wrist rotations

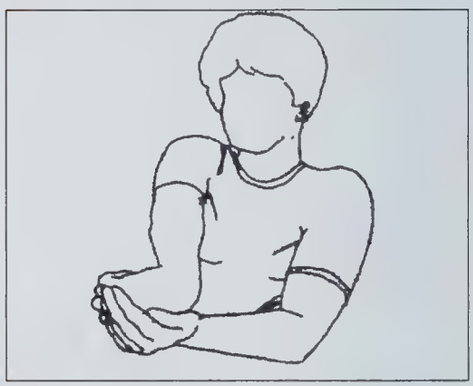


Figure III: Wrist bends

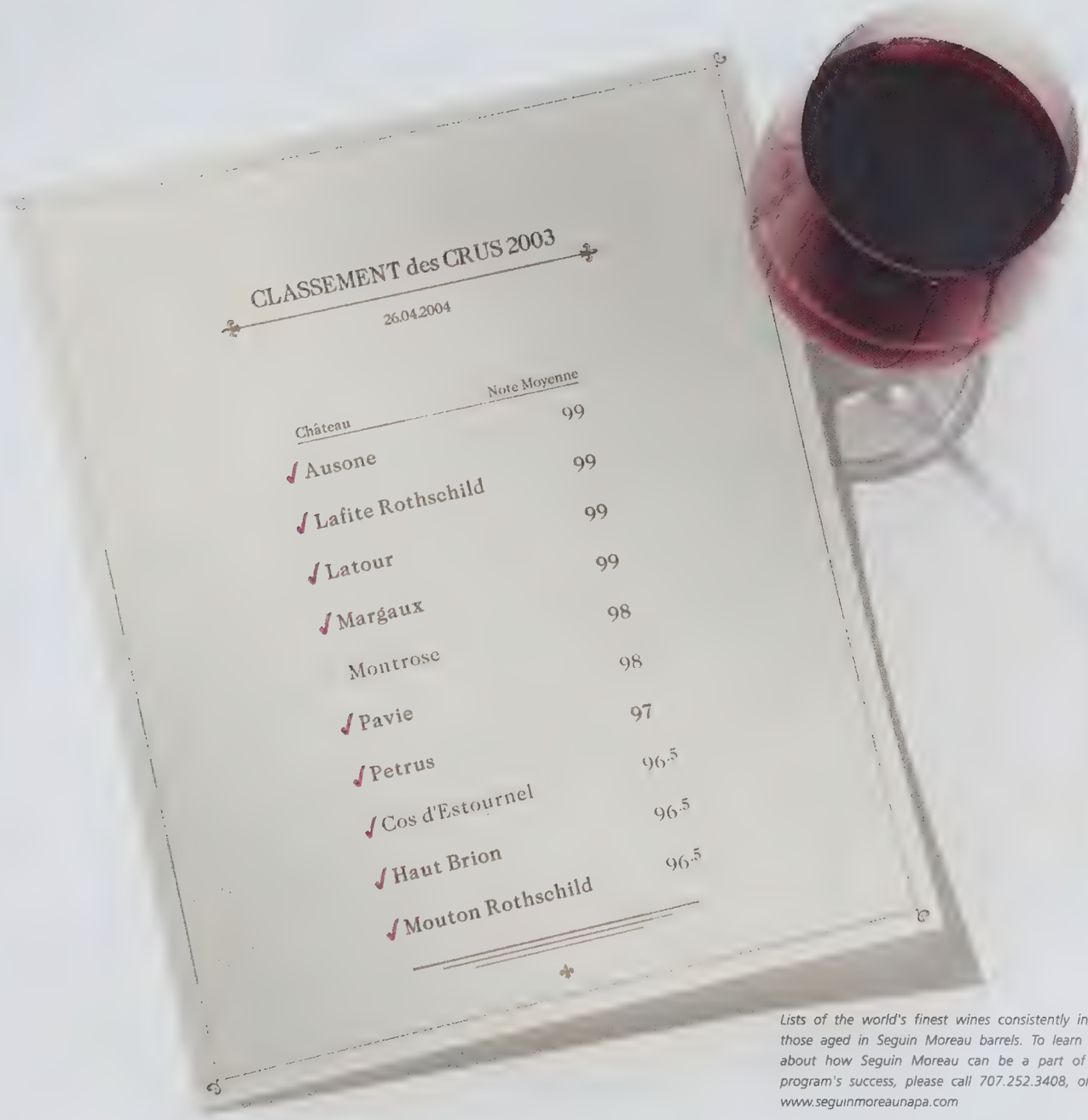
and stretching are not working, may prevent long-term pain.

- If you have had previous serious repetitive strain or overuse injuries, you should be looking at alternative employment that does not involve fixed flexion-type movements.
- Have a copy of the stretches in a prominent place and do them regularly throughout each day.
- Learn to detect muscle tension and stretch it out.
- Ice is the first remedy for an acute injury.
- Enjoy your work and take pride in achieving — negativity tightens muscles!

Coster and Alexander keep a few other injury-prevention devices around their workplace. To reduce eye injuries from pulling canes off trellising wires, workers wear safety glasses. And Coster believes nylon support straps work well to prevent elbow tendonitis in workers with elbow complaints. The straps are approximately two inches wide with Velcro on the ends. They are tightly wrapped around the arm just below the elbow to give the muscles and tendons added support.

Your tools

- Use the right tool for the wood you are cutting — secateurs, loppers, pruning saw, or chain saw as required.



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[†]Source: *The Wine Advocate*, Issue 152, Closing Date 4.26.04

- Choose tools that deliver the greatest power for the least effort.
- Choose tools with a large gripping surface so that low, even pressure is exerted over the whole hand surface.
- Have a grip that protects from hot or cold.
- Keep cutting tools sharp.
- Keep hinged areas oiled.
- Put your hand pruners into your belt pouch when you are not using them.
- Hang your loppers on your belt when you are not using them.
- Strip-cut vines using your left and right hands equally when possible.

Of these tips, it is most important to use the right tools for the weight of wood being cut.

"Supervisors need to make sure that workers are not trying to cut thick wood without the proper tools — such as shears for canes and spurs, loppers for large spurs and small cordons, and saws for large cordons and trunks," Coster confirms.

Short-handled secateurs or snips should only be used for hand pruning. Recent innovations of roll handles may decrease fatigue.

"I'm a big fan of rotating shear handles," says Coster, and Alexander agrees. "I have far fewer flare-ups of elbow tendonitis and less fatigue to my hand. I notice, however, that very few workers use this type of shears."

Similarly, pneumatic and hydraulic secateurs have facilitated pruning where continuous cuts are necessary, as in spur-pruning. New Zealand data show that these tools reduce repetitive strain injuries and fatigue, and pruning time, by about 20%. There are also electric secateurs with power packs available.

"I've tried the battery-operated pruning shears before," reports Robledo. "They reduce finger work, but are too heavy to work with all day. But I've heard good comments from other vineyard managers about this type of pruning shears, including that workers love them once they get used to them."

Alexander likes the battery-powered shears also. "I don't find a weight issue, and speed and endurance are improved. There is an increased danger of cutting yourself, though."

"We have one set of Electrocoup battery-powered pruning shears that we used last year," Coster confirms. "The cost of these is over $1,000 each, which could be justified by faster work, but Glenn is right about more potential for serious injury. If you cut yourself accidentally with these, you'll probably lose a finger."

If using normal hand secateurs, a pair of long-handled loppers is also useful for cutting into two-year old wood.

Robledo believes the key factors leading to tired hands and wrists are related to the tools used. Inappropriate tools for the job, such as poor quality hand shears and loppers, are a big issue. Hand pruning shears that are too small or too big for the worker's hands are another significant factor.

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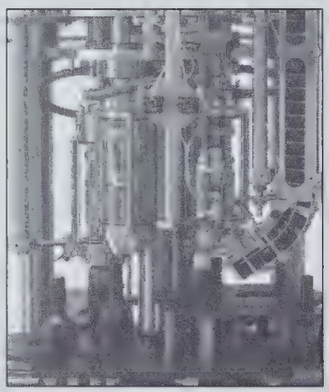

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"Bahco Tools (formerly Sandvick) offers ergonomic pruning shears that fit the size of the hand," reports Robledo. "The best hand-pruning shears are Felco and Bahco. I cannot recommend any other brands. For lopping, Bahco makes the best loppers in the world for grapevine pruning, and Corona loppers are good also."

All of the vineyard managers note the importance of the condition of pruning tools. Poor tool condition is universally detrimental to work quality, work speed, and worker health. The tool's blade, bushing, and pin should be checked frequently for wear, and blades should be sharpened often.

"Sharpen, sharpen, sharpen. Above all else, quality equipment and maintenance — well-oiled and sharpened shears — are the most important factors," says Coster. "All supervisors should carry a ready supply of replacement pruning shears, blades, sharpening stones, and parts."

Supervisors and vineyard managers can control many of the factors that lead to worker injury during pruning. While our New Zealand colleagues have introduced several new procedures and modern ideas into their vineyard practices, and the Americans stress tools and work supervision in their management practices, all vineyard managers can mix and match the guidelines above to create their own injury reduction programs. ■

VARIETAL REVIEW

High desert vineyard in Bannockburn, Central Otago, New Zealand. Photos by Ray Heald.

New Zealand Pinot Noir

Passion, commitment, and innovation drive producers

BY Eleanor & Ray Heald
Contributing Editors

New Zealand more than doubled Pinot Noir plantings from 1,100 hectares (1 ha = 2.5 acres) in 2000 to 2,500 ha in 2004. That's a drop in the bucket compared to production of the variety in Australia, the U.S., or France, but New Zealand Pinot Noir growers are committed to making this genetically unstable, heartbreak grape a flagship red wine.

New Zealand boasts 10 principal winegrowing regions between latitude 35° and 45° south. Regions producing standout Pinot Noir include Martinborough, on the south end of the North Island, and Marlborough, Waipara, and Central Otago on the South Island. Less than half of the Pinot Noir planted acreage is bearing and in Martinborough, half of the plantings yielded their first crop in vintage 2004

A nation comprised principally of two large islands, New Zealand is the only maritime grapegrowing region in the world, which might not be considered optimal conditions for growing Pinot Noir. New Zealand's best regions for the variety have a number of climatic factors in common, including diurnal temperature shifts, distance from the coast, and heat summation.

During the growing season, significant variation between minimum and maximum daily temperatures (diurnal shifts) may be the most important factor. Warm days, but not much hotter than 30°C (86°F), with cool nights indicate a continental, rather than a maritime, climate that suits Pinot Noir well.

To take advantage of diurnal shifts, vineyards need to be inland from the coast, but not so far inland that frost events make winegrowing risky. In California, coastal fog creates an appropriate diurnal shift, but this is not the case in New Zealand.

Heat summation is an additional factor signaling the best regions for Pinot Noir. New Zealand viticulturists suggest that 850°C to 1,100°C (1,530°F to 1,980°F) growing degree days (GDDs) hit the target.

Challenges on the road to Pinot Noir success

About 500 wineries are scattered throughout New Zealand, contributing 0.2% of world wine production. With a population of only 4.2 million, production of every variety, and more specifically Pinot Noir, is focused on export markets including the U.S.

Villa Maria Estate's export manager Ian Clark notes that 45% of production is exported, with the United Kingdom, U.S., Australia, and the Netherlands taking the lion's share. Because the New Zealand market is static, over the next few years, Villa Maria plans to increase export sales to 60% of production.

Phyll Pattie, owner with her winemaker/viticulturist husband Clive Paton of Ata Rangi in Martinborough, suggests that New Zealand Pinot Noir has an exciting future provided "all producers are committed to quality. Yes, Sauvignon Blanc introduced New Zealand wines to the world but Pinot Noir is destined to be the country's flagship red."

Grant Taylor, winemaker for Gibbston Valley Vineyards and his own Valli label, notes several challenges to be overcome before this rosy Pinot Noir future can be achieved. "Currently there is a shortage of labor such as vineyard managers with experience to train workers," he maintains. "With more fruit coming on stream, the lack of facilities for processing will become a concern.

"For the newest, close-spaced vines (1m x 1m) and only 18 inches above ground in Gibbston, the coolest region in Central Otago, I question whether we'll be able to obtain a labor force to

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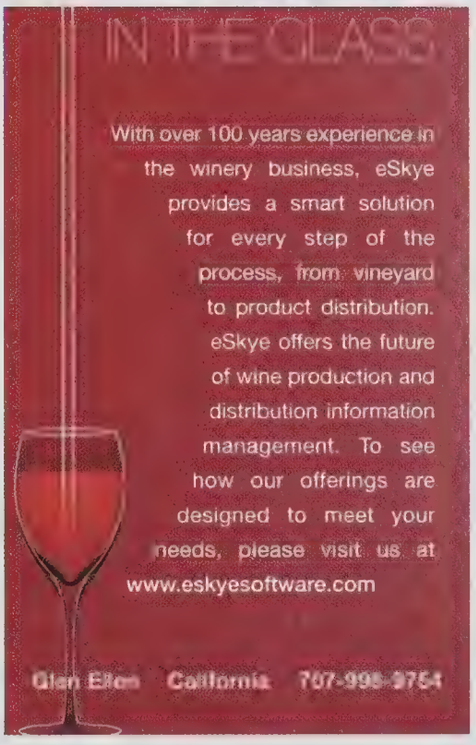
Villa Maria Estate, Blenheim, Marlborough
George Geris, Winemaker,
Guy De Lautour, Vineyard Manager,
Ian Clark, Export Manager

work these vineyards. Additionally, vines so close to the ground are more susceptible to frost damage."

Growers will need to avoid overproduction to do well in the future. Getting the word out in a hugely competitive global marketplace is also challenging, and then there's pricing. The best New Zealand Pinot Noirs are in the $35 to $40 retail price range, putting them in head-to-head competition with top-flight offerings from Oregon and California's Russian River Valley, Carneros, Santa Rita Hills in Santa Barbara County, and the Sonoma Coast, to name a few.

Expensive, small domaine red Burgundies may present less competition when it comes to price, but on reputation they can't be beat, particularly among connoisseurs. (Yet, such a statement begs the question, does Bur-

Chard Farm Vineyards on the banks of the Kawarau River Gorge, Central Otago, New Zealand.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gundy hold the ultimate model for Pinot Noir that it once did?)

Ross Lawson (Lawson's Dry Hills, Blenheim) believes, "It's critical that we keep pricing below $25 for our Pinot Noir in the U.S. market in order to sell it. We're concerned that expectations for demand will not materialize if our wines are too expensive."

On a positive note, Taylor adds, "At a lower price point, Allied Domecq Wines New Zealand (formerly Montana Wines Ltd., using Brancott label in the U.S.), entry into the Pinot Noir market will heighten interest."

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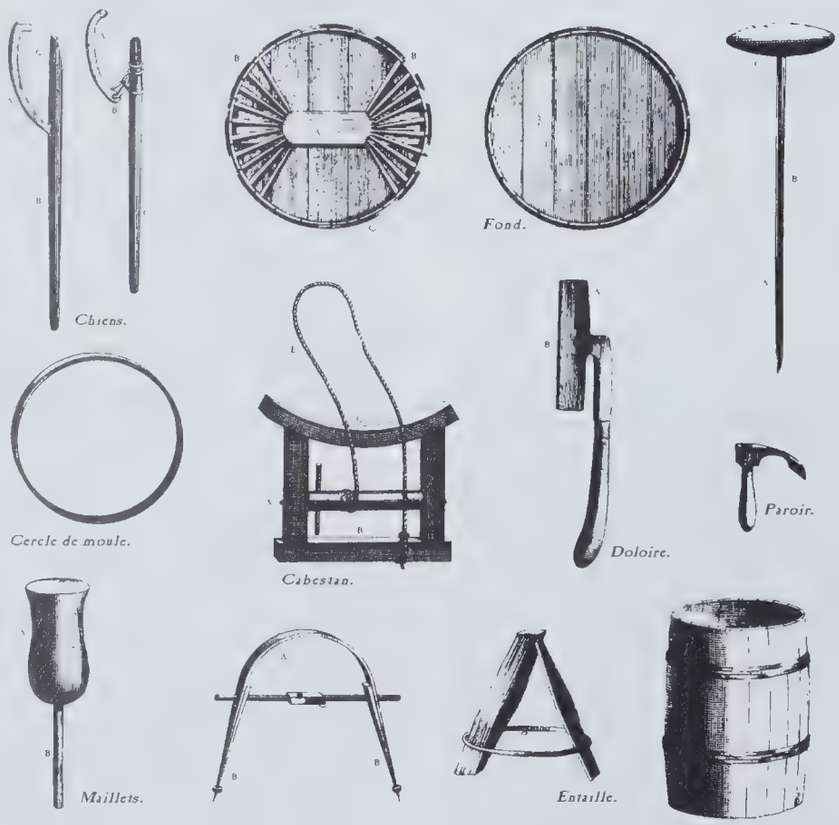

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Martinborough

Officially part of the Wellington wine region, which occupies a southern section of the North Island, Martinborough is both a town and the oldest and best-known wine area for Pinot Noir.

Benefitting from low annual rainfall of about 750mm (25.4 mm = 1 inch); potential to irrigate in summer months; long, dry autumns; and requisite diurnal shifts, Pinot Noir is the most planted and successful variety in this region.

Soils are fairly uniform, and Martinborough's maritime climate is similar to Marlborough's. Yet, as Roger Parkinson, winemaker/CEO at Nga Waka notes, "The Tararua range to the west (part of the mountain spine on the North Island) protects locations to the east. Martinborough's hills reduce the maritime influence and create a continental-like climate well-suited to Pinot Noir. Old river bed soils with a gravel base and shallow top soils are fairly uniform throughout the area."

Growing Degree Days in the region range from 1,080°C to 1,150°C (1,955°F to 2,070°F).

The last 20 years have witnessed significant plantings in Martinborough. There are more than 800ha under vine, only 3% of the New Zealand total acreage.

Martinborough viticulture

Oliver Masters (Ata Rangi) reports that 150 to 300mm of rain fall annually during the growing season, with most in the spring months of October and November. From early December to the end of February, the irrigation regimen is 10L to 15L per vine per week (3 to 4 gal/vine/week).

According to Masters, Martinborough is one of the windiest grapegrowing areas in New Zealand. Wind damage at flowering can cause fluctuations in yield. To compensate, row orientation for vines, whether just planted or 25 years old, is ideally northeast-southwest, enabling one row to shelter the next.

"Wind benefits are low botrytis and no downy mildew pressure," says Masters. We spray with sulfur and foliar nutrients only."

Bud break occurs in the third week of September, flowering in early December, and veraison in February. Depending on vintage, harvest occurs anywhere from the last week of March through the end of April.

Nigel Elder, viticulturist, considers Abel (Burgundy origin) the best clone for Martinborough Vineyard. "The 10/5 Clone is our oldest, most widely planted clone, and in a good (hot) year, makes an excellent contribution to the blend," says Elder. Among older plantings, there is Wadenswil, UCD 5, 6, and 13. Dijon clones include 113, 114, 115, 667, 777, and 375.

"At this juncture, with only eight years experience with the Dijon series," Elder maintains, "I'm not convinced that these clones are as important in New Zealand as they were made out to be. I think we need to see them with a bit more age before judging their potential."

Parkinson agrees with the Clone 10/5 assessment. "It grows upright and does well on a vertical shoot-positioned (VSP) trellis, provided that it's crop-thinned. In New Zealand, we call the Pommard-origin clone UCD 5, but it is not the same as what Oregon producers call Pommard.

"From what I can evaluate now, Clone 114 contributes to overall wine structure. Finesse and red fruit characters that add to Pinot Noir's seductive qualities come from Clone 667. Abel is the spine with supple tannins."

"Rootstock controls plant vigor," Elder continues. "We've used 3306, 5C, 5BB, Riparia Gloire, and 420A but consider 101-14, 3309, and Schwarzman the best."

Parkinson is not sold on the relationship between rootstock choice and vigor. "5C is a vigorous rootstock and 101-14 is devigorating, but I've not noticed any difference between them," reports Parkinson. "My theory is: high vigor rootstocks exhibit high vigor on high vigor sites."

Noting that root competition doesn't control vigor in Martinborough vineyards either, Parkinson has planted his vineyards 1.5m between vines with 2.2m wide tractor rows (1m = 2.28ft) totaling 3,000 vines/ha.

At Nga Waka, vines on a VSP trellis with two canes are pruned to 30 buds/vine once they are five years old. They yield 2.5Kg/vine (1Kg = 2.2lb).

At four-inches of shoot growth, Parkinson shoot-thins to get bunch spacing correct. Typically, hedging is done in January but in wetter years, in December. A second hedging is done in mid-February before nets are put on to protect the crop from starling damage.

"I've tried all the Richard Smart training and trellising," Elder adds, "but I've now retrofitted all those to a VSP trellis. It works and it's easy."

All producers, regardless of region, remove leaves in the fruit zone in December. Early leaf removal, they believe, avoids sunburn. Sudden exposure of bunches in the hottest part of the season (January–February) is asking for problems. Disease prevention through the creation of better airflow is another benefit.

Martinborough Vineyard has three vine spacings. Oldest plantings are 1.5m x 3m, which in Elder's opinion, does not offer sufficient root competition. He is satisfied with both 1m x 2m and 1.7m x 2.2m spacing.

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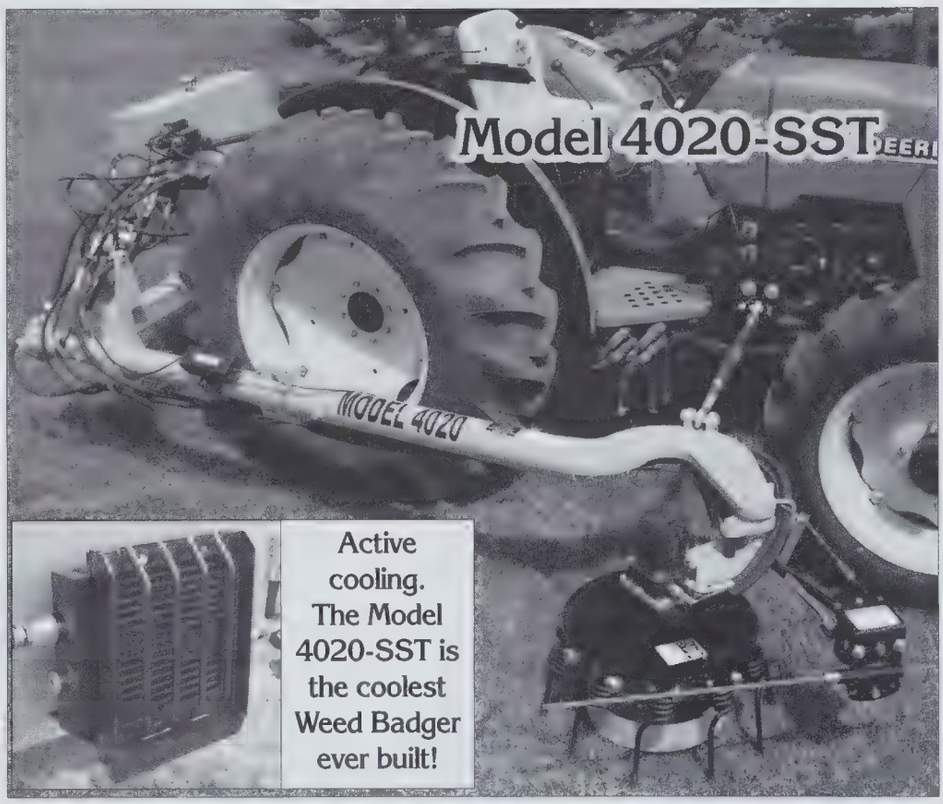

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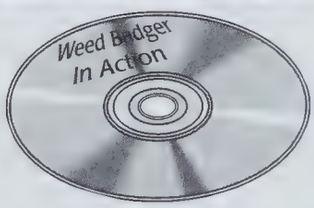

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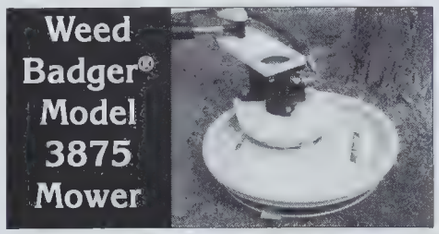

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Elder also cane-prunes but to only 16 to 20 buds per vine with yields of 1 to 1.25Kg/vine.

"Viticultural practices make a huge impact on the wine," Clive Paton (Ata Rangi) contends. "We employ a mix of practices in small blocks from 0.10 ha to 1.4 ha in size, that aid in optimizing picking time.

"Pruning weights, however, are poor predictors of the upcoming growing season."

Based on tractor size, the original plantings were 1.5m x 3m. Newer equipment accommodates 1.25m x 2m spacing, on a VSP trellis. "After seven years experience," adds Masters, "we're content with 4,000 vines/ha because the vines appear to be in balance.

"However, don't take this as a regional model. It's largely dependent on depth of topsoil, which in Martinborough ranges from zero to 300mm."

At Ata Rangi, where Abel is the preferred clone, close-spaced vines on a VSP trellis are cane-pruned to 20 to 25 buds/vine and yield about 1.2 Kg/vine. Vines on a Scott-Henry trellis yield 3.5 Kg/vine.

Marlborough (Wairau Valley)

With the first vines planted in 1973, Marlborough became known quickly for its distinctively pungent Sauvignon Blanc. A long growing season with abundant sunshine and cool nights is also ideal climate for Pinot Noir.

Growing Degree Days range from 1,150°C to 1,250°C (2,070°F to 2,250°F).

From soil evaluation, winegrowers became aware of specific soil profiles well-suited to Pinot Noir. Plantings on the free-draining alluvial loams over gravelly subsoils in the Wairau and Awatere River valleys have proved ideal.

In 1982, the last flooding of the Wairau River deposited more stones and sand, and newer plantings of Pinot Noir in these soils are doing well. West of Renwick, recent plantings at higher and cooler elevations show promise. However, these vineyards, like Gibbston in Central Otago, are frost-prone.

Typically, bud break occurs in October with flowering in November into December and veraison in January/February.

Marlborough viticulture

"Yet," says George Geris (winemaker at Villa Maria's Marlborough winery), "that description of Wairau Valley gives the impression of reasonable homogeneity. This is a diverse river valley. There are altitude changes, temperature and rainfall differences, and varying soil profiles."

Geris views the Waihopai Valley, west of Blenheim as cooler. There, stony soils have silt topsoil. The Wairau Valley, northwest of Blenheim is the stoniest. Awatere Valley soils, southeast of Blenheim, are illustrated well by Villa Maria's Seddon Vineyard and Taylor Pass Vineyard.

"In addition to the stony soil on river terraces," Villa Maria's vineyard manager Guy De Lautour notes, "Seddon is a hot terrace. We believe that the best Pinot

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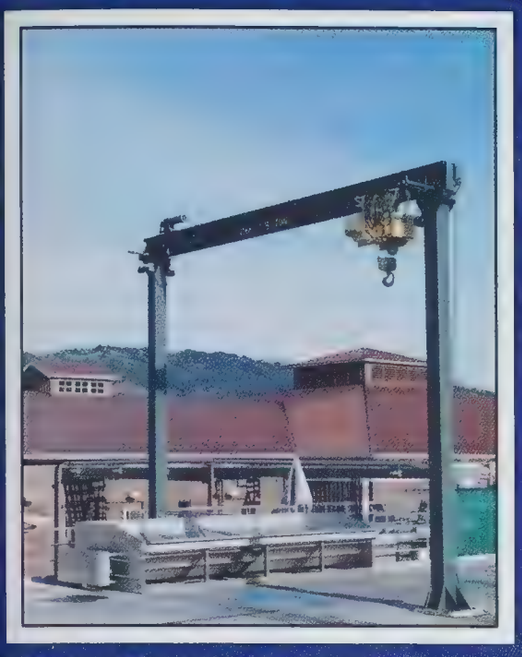

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Noir comes from not only stony vineyards but those that ripen early, at the end of March into early April.

"Older soils on the south side of the region are heavier with less stones. Hillside vineyards southwest of Blenheim are older soils with more clay. At Villa Maria, we plant Pinot Noir on stony soil.

"Every year, UCD 5 and Dijon 115 ripen first. Over the long term, however, Dijon 667 could be the best. George [Geris] likes it for its concentration and density of flavor."

However, Geris maintains, each of the Dijon clones has performed differently in different vintages. "We also have different performance from the north and south valleys. In 2002, the Reserve Pinot Noir came from north valley vineyards and in 2003, from the south. So much depends on the overall growing season."

Villa Maria is typical of other Marlborough wineries in converting two-cane VSP with spur pruning to a bilateral cordon, pruned to two-bud spurs and 20 to 25 buds/vine.

"The move to mechanical pre-pruning," Cloudy Bay's viticulturist Siobán Harnett in Blenheim says, "makes a bilateral cordon desirable. Pre-veraison, we also do mechanical leaf plucking which is cost- effective. We shoot and bunch thin by hand, sometimes twice."

On the other hand, Harnett does not want to harvest Pinot Noir in March. "Even in a hotter season where we let a heavier crop hang to delay ripening," she remarks, "picking Pinot Noir later not only gets the crop ripe, it develops better flavors."

Cloudy Bay has a new Pinot Noir planting in the Omaka Valley, one of the southern valleys that feeds into the greater Wairau Valley. Clones selected are Dijon 667, 777, UCD 5, and an Ata Rangi clonal selection. Rootstocks are Riparia Gloire, 3309, and 3306. Harnett believes that 101-14 is too shallow-rooting and is not the best choice for the aged alluvial/colluvial soils.

"In the end, vine age trumps clone," notes Harnett. "So we need to wait and see if we made the correct decisions.

"The land is undulating with north-facing slopes. Hotter days and cooler nights are great for color, but we'll need to be vigilant about frost mitigation.

"We will consider wind machines and overhead sprinklers for a new vineyard. We are presently using helicopters over existing vineyards. Ideally launched after 3 a.m., one helicopter can give significant air circulation and increase the air temperature by 2°C. Helicopters are our most versatile frost protection tool, being so mobile both across the vineyard and in working altitude. However we are reliant on an inversion layer of warmer air being available to us."

Martinborough and Marlborough winemaking

Although they base final decisions on taste, winemakers are consistent in suggesting Pinot Noir picking parameters of 23.5° to 25.5°Brix, 6.5 to 8.5 g/L TA, and 3.3 to 3.5 pH.

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Visual clues to maturity include berry softening with a slight shrivel, brown seeds, yellowing basal leaves, and woody stems. Different clones are frequently picked separately.

From arrival of fruit at the winery to bottling, winemaking techniques among producers interviewed are similar. Typically, a maximum of whole berries (percentage dependent upon equipment) receive 30 to 50 ppm SO_2 at the destemmer.

If necessary, acid correction to a pH of 3.4 but less than 3.56 is made. "Adjusting acidity at cold soak," Geris maintains, "is an important element in making great Pinot Noir. I shoot for a pH of 3.4 to 3.45 pre-malolactic fermentation (MLF). If you get the acid right at cold oak, it's correct for the remainder of production."

Pre-fermentation maceration (cold soak) at either ambient cellar temperature of 13° to 15°C (about 55°F) or chilled to 8°C (46°F) follows for 5 to 7 days. Length of time depends on the quality of fruit in a given vintage. Pumpovers as needed are routine during this stage.

Rather than pumpover during the cold soak phase, Lawson's Dry Hills winemaker Marcus Wright prefers to do light punch-downs.

Once fermentation becomes active, either naturally or via addition of the winery's preferred yeast culture, punch-downs of 3 to 5 times/day begin.

Because winemakers seek the "layers of complexity" advantages of klekkora in the early stages of fermentation, they allow an uninoculated fermentation to proceed until 3° to 4°Brix before adding a yeast culture, or mix of several.

In a 4- to 5-day fermentation, peak temperature, measured under the cap before a punch-down, is 32° to 33°C (about 90°F).

Depending on desired level of extraction, style, and vintage, total skin contact ranges 15 to 21 days.

A different technique is practiced by Wright at Lawson's Dry Hills. On the day before pressing, he inoculates for MLF with a vinaflora culture.

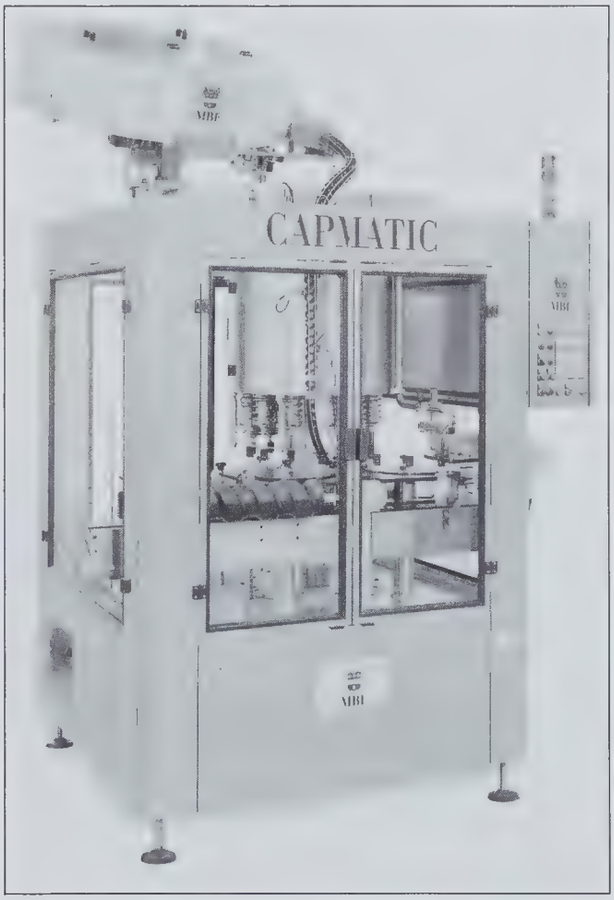
Wine is pressed off and all of the wine is either transferred direct to barrel (1/3 new for regular bottling and 40% to 50% new for reserve wines) or allowed to settle in tank for 48 hours before transfer to barrel. To create multiple nuances in the wine, producers select from many French coopers.

Timing of MLF, usually inoculated, presents a major difference in winemaking approaches, resulting in two different palate influences.

In general, winemakers believe that early MLF (in winter) creates a wine that is more approachable with a fuller, more harmonious mouthfeel.

MLF finishing in spring is made possible by either cold, ambient cellar temperature or deliberate chilling of barrel storage rooms at 18° to 20°C (about 65°F) in winter and slow warm-up in spring. Spring MLF retains brightness, freshness, and enhanced color.

GOT CAPPERS?



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To attain the best of both worlds, some producers choose to have 65% to 70% of barrels complete MLF early and retain the balance of barrels for spring MLF.

Uninoculated spring MLF has been the practice of chief winemaker Kevin Judd at Cloudy Bay. To avoid *brettanomyces* problems, he is conducting experiments with uninoculated winter MLF. Once MLF completes, SO_2 is added at 60ppm.

Many wineries' barrel ageing regime extends 11 months for a regular bottling and 17 to 18 months for a reserve style. At most, wine gets one racking near Christmas, with O_2 if needed.

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Waipara

Canterbury consists of two major wine areas, the plains around the city of Christchurch and the more recently developed area of Waipara.

A range of hills to the east of Waipara on the east coast of the south Island, separates it from Pegasus Bay and chilling Pacific Ocean winds. The Southern Alps (or Main Divide) lie to the west. The region's hot or "nor'west" winds blow from this direction.

If one looks at the typical growing degree days of the Canterbury region, in the range of 900°C to 1,100°C (1,620°F to 1,980°F), one gleans the wrong impression of Waipara. Yet, in more sheltered positions, affording warmer days, where nights are not as cold, and autumns are dry, Pinot Noir ripens fully.

Soils are principally chalky loam, frequently rich in limestone.

Waipara viticulture

Pegasus Bay Vineyard, a unique sheltered site within the Waipara Valley, gains maximum protection from its location, tucked under the lee of the Teviotdale range. Smooth stones and gravel deposited by an ice age glacier grant additional heat summation of 1,150°C (2,070°F) along with a low fertility and free-draining soil profile.

Such operations as shoot and crop thinning, leaf removal for berry exposure in the fruit zone, and fruit selection at harvest are routine vineyard practices.

"Plantings of Clone 10/5, now 20 years old in the Pegasus Bay Vineyard, tend to exhibit a beet-root character," says Lynnette Hudson, who partners with her husband Matt Donaldson in winemaking. "We're not fond of Clone 10/5 in our soil; however, our oldest vines are 10/5 and are developing better structure and flavors with age."

A mix of Dijon clones that are now five to eight years old are more vibrant in the red fruit spectrum and offer a linear structure.

Waipara winemaking

Hudson has worked extensively in Burgundy and is influenced by French methods for producing Pinot Noir.

Typical pre-fermentation maceration of whole berries for 6–7 days is fol-

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lowed by fermentation in 2-tonne (1 tonne = 2,200lb) plastic open-top fermentors. Manual punch-downs several times daily are routine.

"Longer skin contact in cooler vintages creates less-perfumed wines with harsher tannins," Hudson maintains. "Our practice in cooler vintages is 15 days maximum skin contact, which often means we press at dryness. In riper vintages, 28 days skin contact is our maximum."

After pressing, wine is transferred to barrels, three to four of which are inoculated and go through MLF. These barrels are then used to top other barrels, retained during the winter at 8°C (46°F) ambient cellar temperature until the cellar warms and they complete MLF in the spring.

Wine remains in French oak cooperage for 18 months, is bottled unfiltered, and bottle-aged one year before release.

Hudson believes that New Zealand Pinot Noirs age quicker in the bottle than most small domaine red Burgundies. "It may be a result of the light intensity in New Zealand and its impact on the phenolics in the berry skins and seeds," she explains.

"Additionally, I also attribute quicker ageing to young vines. We have a lot to learn and understand with regards to new Dijon clones, in terms of site selection and soil types. We don't have enough experience with them to understand their adaptation to our soils and climatic conditions."

Central Otago

Located at latitude 45° south, Central Otago, a series of subregions, is the world's southern-most grapegrowing region. The fact that there is no traffic light within 25 Km (15 miles) of any vineyard in the appellation gives one a good idea of how sparsely populated it is.

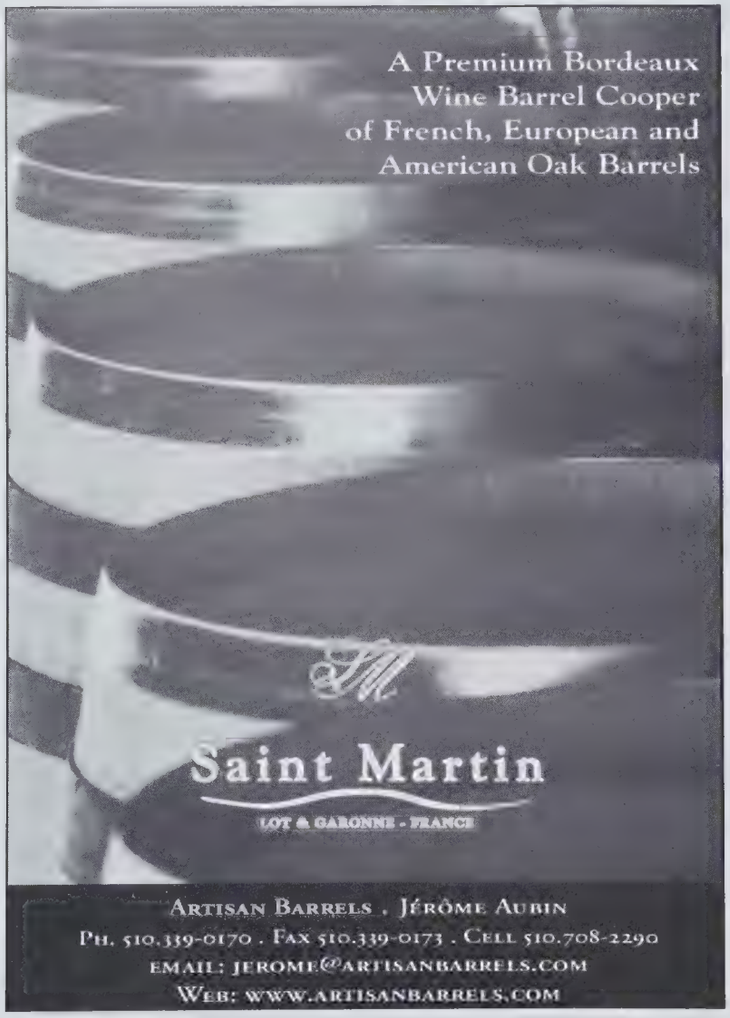
The first commercial release of a Pinot Noir, the region's flagship variety, was 1987 from pioneer Alan Brady, then winemaker at Gibbston Valley Wines. Today, Brady is owner of Mount Edward, a specialist Pinot Noir producer.

Rugged mountains, the Kawarau River and Lake Wanaka have, over time, shaped macroclimates, microclimates, and exposition of potential vineyard land. Most northerly of the subregions is the moderately cool Wanaka, where the lake of the same name offers frost protection.

Although it may have the largest potential grape acreage and is one of the warmer areas, Lowburn has few north-facing slopes.

Many wineries based elsewhere in Central Otago are looking to the warmest, arid, and most-recently planted Bendigo subregion. Its north-facing ridge at the junction of the Cromwell and Lindis valleys, with rolling north-facing hills below, offers enormous potential.

One of the earliest subregions to be planted, Alexandra is the most southerly of the subregions. Gibbston, although the coolest of the subregions, is a north-facing valley slope of the Kawarau River Gorge, east of Queenstown. There, Pinot Noir ripens later than elsewhere, but those who have



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vineyards there extol the rich flavors achieved by extended time on the vine.

"Reference is often made to the Cromwell Basin," Carrick's (Bannockburn) winemaker Steve Davies notes. "That's a broad region including Bannockburn, Lowburn, and Bendigo. Although Bendigo is slightly warmer, the three areas are fairly similar and regional differences are not so great that they are detected in the wine."

Most extensively planted of the subregions, Bannockburn is a north-facing crescent bordering the Kawarau River. There, sites once favored for gold mining are now favored vineyard locations.

Generally, low humidity and low rainfall in Central Otago reduce disease pressures, especially of *botrytis*, to which Pinot Noir is particularly susceptible.

Throughout the numerous subregions, soil composition is markedly similar — heavy loam broken up with significant river gravel, which prevents it from being waterlogged. Low organic matter and advantageous minerality are other positives.

Central Otago viticulture

Typically, plantings are close spaced (approximately 1m x 1m), either cane- or cordon-pruned on a VSP trellis, with yields around 2 tons/acre.

"Performance of Pommard and Dijon Clones in Oregon," Grant Taylor explains, "indicate a good future in Central Otago. Earlier than the traditional late ripening Clone 10/5, Pommard clones, UCD 5 and 6 offer flesh to the wine, while Dijon clones such as 115 offer structure and tannin.

"The best rootstocks are devigorating Riparia Gloire and 101-14. There's more vigor here than soils may indicate. If producers have built a reservoir, then irrigation practices will keep vines in balance."

Shoot thinning, shoot positioning, leaf removal, and bunch thinning are routine practices.

A previous bare earth policy has been phased out in favor of inter-row planting of different cover crops to control vigor, improve soil health, and offer biodiversity.

Central Otago winemaking

Picking parameters mirror those of Martinborough and Marlborough and winemaking practices are similar throughout New Zealand.

"We're all doing much the same thing," Chard Farm (Gibbston) winemaker John Wallace maintains. "Differences enter on whether to let fermentation begin naturally, after a 5- to 7-day cold soak, or to inoculate after fermentation begins naturally to ensure that it completes.

"We try to retain as many whole berries as possible and do not use whole clusters. Typically, total skin contact time is 19 to 21 days. Another winemaker choice is winter or spring MLF and choice of French oak coopers.

"Then, there's the percentage of new barrels used. Since I don't like oak dominating the fruit, I use only 25%, but others make the choice for a larger percentage — generally not more than 1/3, however."

Felton Road research

Research conducted by Steward Elms in 1991 identified north-facing slopes at

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the end of Felton Road in Bannockburn as one of the warmest and most ideal sites in Central Otago for Pinot Noir.

"We call it a Côte d'Or-type climate," Felton Road viticulturist Gareth King maintains. "We're one gully west of the historic Bannockburn Gold Sluicings. Our site was not sluiced. Natural waterways that drained Felton Road's slopes and divided the fans consequently isolated soil types to give us 13 different blocks."

Planting began in 1992 and by 1994, 11 ha were under vine. In three blocks, Dijon Clones 113, 114, 115, 667, and 777 are on a variety of low-vigor rootstocks with a density of 4,000 vines/ha. Pushing the envelope to a Burgundy model, a small trial block (0.6 ha) was planted in spring 2002 at a density of 6,667 vines/ha.

Pinot Noir clones planted in other blocks include 10/5, UCD 5, 6, and 13, D5V12, and Abel. Wherever Pinot Noir is planted on the property, it's on heavier, higher clay content soils with a good mix of gravel to drive a deep root structure.

In drier parts of the vineyard, mulch and organic compost are used to retain moisture and minimize the need for irrigation and to balance areas of lighter, more free-draining soils.

Sustainable practices

Climate in New Zealand wine regions keeps disease pressure low. Focused on the integrity of vineyards, spray programs are kept at minimums in accordance with New Zealand Integrated Winegrape Production (NZIWP).

The NZIWP framework provides a scheme for environmentally and economically sustainable vineyard practices to protect the environment. NZIWP follows what it calls a "scorecard format" outlining routine vineyard practices paralleled with a compliance rating (similar to a Swiss system). Best practices are rewarded with high scores. The scorecard acts as a living document defining NZIWP as a system of ongoing improvement.

It is common practice in newly-planted vineyards to control spring weeds with herbicide, sprayed at least once per season through the third year after planting. It is phased out as vines mature and trunks can handle mechanical under-vine mowing and cultivating. Viticulturists state that a herbicide such as Roundup is not a residual chemical. They contend that its use once or at most twice/year to control weeds is not a big contaminant.

Research funding from both the Wine Institute of New Zealand and the New Zealand Grape Growers Council is focused on natural product-based herbicides and fungicides and integrated disease management systems. These are destined to become significant factors toward the aim of naturally sustainable viticulture and winemaking.

Where economically viable, composting is practiced by wineries like Ata Rangi that have moved in the direction of biodynamic compost additives including: yarrow (*Achillea mille-*

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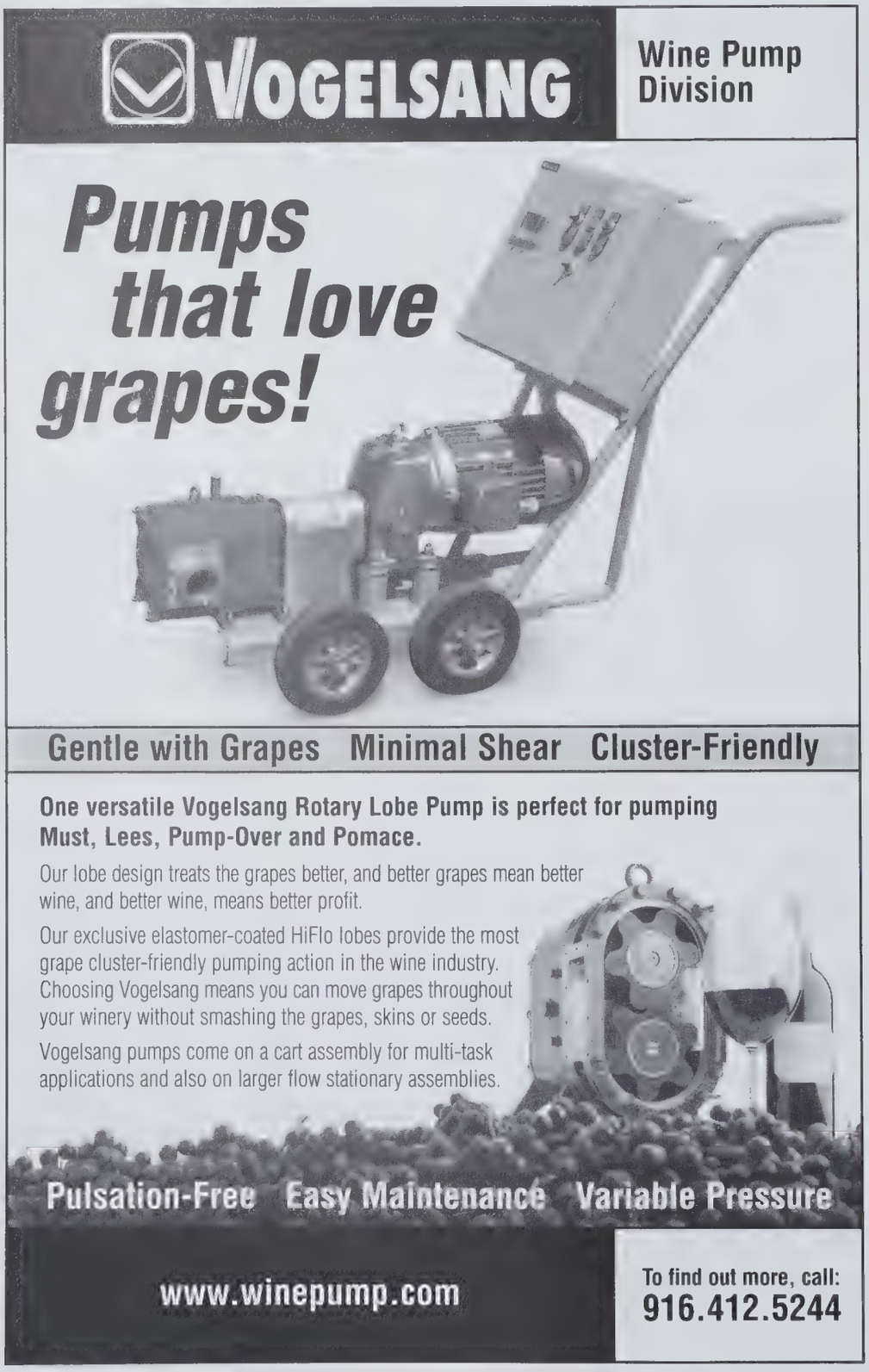
For wineries using NZIWP practices, a permanent green crop that includes summer grasses and a flowering annual field mix that attracts beneficials is planted in tractor rows.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Several wineries ascribe to the philosophies of the Living Wine Group (www.livingwine.org.nz) or have been certified ISO 14001.

Avian pressures

Bird problems plague New Zealand vineyards. Use of white side netting (which is reflective and preferred over black bale netting) is out-pacing over-the-vine netting to counteract starling problems.

"Bird netting," contends King, "could be eliminated if New Zealand vineyard owners would plant more trees. Because we have trees at Felton Road, we don't net vines near the end of veraison, except for a few outside rows, which are pressure areas.

"In all the wine regions, people are cutting down trees like mad. Why? Because they want to get rid of birds? They think they're getting rid of birds, but what they're doing is turning the land into a monoculture. As a result, their property gets a bird strike — massive flocks of birds, like starlings, that come in because there's nothing else for them there to keep them away.

"We need to attract more birds and plant more crops to attract them. Where there are populations of other bird species, the flocks of starlings that come in, will not find an environment that they enjoy. If trees with other berries and fruits are planted, the starlings will feed on those. They are more palatable to starlings and they enjoy them more. A Lincoln University study has shown that areas with native plantings have lower bird strikes."

At Felton Road, King uses rose hip (a sweet briar) planted in the surrounding hills for birds, such as wax eyes, to feed on. With more seed crops in the tractor rows, seed-feeding birds are attracted. When there's a significant population of other birds, large flocks of starlings are not interested in being there. Smaller birds flutter up and spook the starlings, so they move on.

Screwcaps

In February 2001, winemakers from the Marlborough region of New Zealand held a workshop to consider alternatives to replace corks as the bottle closure. A small group was assigned the task of investigating screwcap systems, and the viability of using screwcap closures for premium wines.

The activities of the Marlborough group stirred interest from winemak-

ers throughout New Zealand's other wine regions. Wineries decided to work cooperatively through a new national body, and the New Zealand Wine Seal Initiative was formed. Interest in the work of the Initiative has steadily increased, as the benefits of screwcaps (and the problems faced by other closure types) become apparent to winemakers, distributors, writers, and consumers around the world.

The initial reward of the Initiative's work was the release of a sizeable number of premium New Zealand wines from the 2001 vintage under screwcap. These wines represented every wine-producing region in the country and several varieties, including Pinot Noir.

While this is positive news, most New Zealand producers, excluding Villa Maria, indicated that they continue to bottle with corks for the U.S. market. Why? Because distributors believe that U.S. consumers will not accept a premium wine, like Pinot Noir, with a screwcap closure.

In addition to educating U.S. consumers about Pinot Noir in general, are we to assume that we need to educate them better about a closure that keeps a wine fresh and eliminates cork taint?

Last drop

New Zealand Pinot Noir producers are excited about the variety, and they're open in stating that it's the real reason they choose to live in an area with suitable growing conditions.

At these early stages in their history, New Zealand Pinot Noirs are both intellectual and consistent; often reflecting regionality and site personality. The tomato stock character in the earliest vintages has totally disappeared.

Producers in each of these premier Pinot Noir regions believe that, with each succeeding vintage, they gain greater understanding of their vineyards to entice the best from the vine.

Flexibility and trial and error are accepted New Zealand methodologies in developing the know-how to work with variable vintage conditions. New Zealand Pinot Noir viticulturists and winemakers aren't afraid to be wrong, and this attitude is impressive. ■

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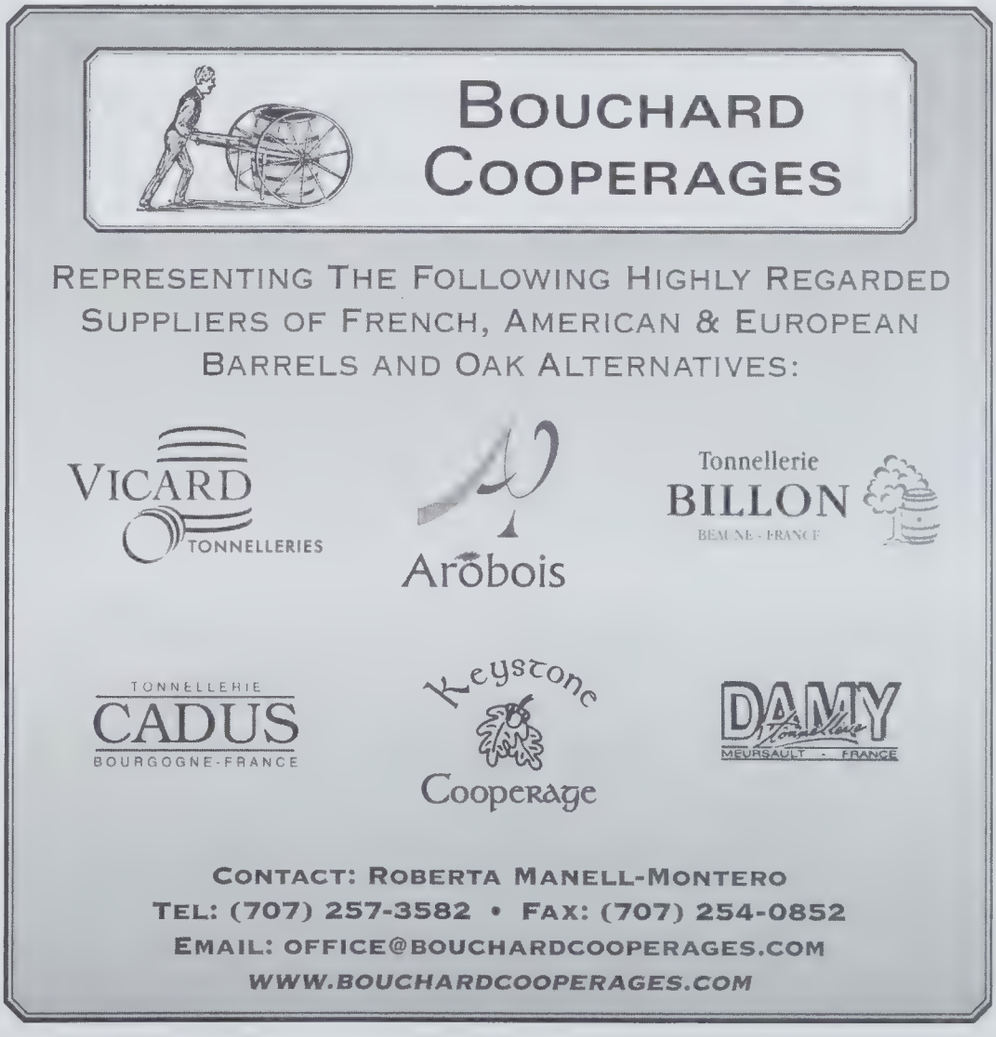


NEW ZEALANDER ANNABEL LANGBEIN

Balancing act with Pinot Noir

BY Johanna Rupp

"Pinot Noirs are naturally sexy wines. They have voluptuous, roll-around-in-your-mouth flavors that you can really savor, plus a tangible chewiness in the palate. Yet, they are often quite refined, with a fine complexity that many a hotter climate varietal does not reveal. There are so many styles within Pinot Noir that you can easily weigh it against a variety of foods to find excellent matches," says Annabel Langbein, New Zealand cookbook author and horticulturist. She has created an approach to food and wine pairing based on a concept of balancing their weights to create a harmonizing and complementary sensory experience.

Langbein believes that when food and wine have equal weight and are paired well together, they match one another in density, body, richness, and complexity. In addition, a wine's tannin and acidity levels must be matched appropriately with foods that can stand up to them. For example, delicate wines should be paired with delicate foods; bold wines with more tannin and acidity should go with more heavily flavored foods.

Considering matches across the wine spectrum, Langbein says, "A simple light dish, such as fresh tuna marinated in a little lime zest and olive oil has quite a fresh zing of flavor and as such goes perfectly with a light and zingy wine, such as Sauvignon Blanc.

"Salmon with hollandaise and pine nut stuffing is a more substantial dish with richer flavors and partners well with a Chardonnay — it shouldn't be too big and heavy though. A huge, buttery Chardonnay would overwhelm the dish. A Chardonnay that is light in style is a good choice for this reason.

"Naturally rich foods, such as grilled meats, red meat, and heavily spiced dishes, balance well with wines that have more tannins and greater acidity. Cabernet Sauvignon and Zinfandel work well with grilled steak, lamb, or venison because these wines have a depth of flavor that will not be overwhelmed by the complex flavors of the meat.

"A red wine from deep in southern France, with all the body and weight and richness that that climate delivers, tends to go well with richly flavored tangines of Morroco," Langbein explains. Tannins help cut the fat in a dish, helping to balance its richness. Not only does tannin mirror the steak in intensity, for example, but it also works with the meat to create a new sensory experience of both that one would not experience by drinking Cabernet alone or by enjoying a grilled steak without wine.

Putting her approach into practice with Pinot Noir, Langbein finds that this varietal, in particular, is a versatile and appealing accompaniment to many types of cuisine. "When first bottled, Pinot Noirs, like many wines, exhibit a lively fruitiness.

"Because the fruit is fermented with the skin, pips, and sometimes stems, it picks up texture from these components. Often Pinots Noirs are low in acidity (compared to Cabernet Sauvignons, for example) and less tannic than most other red varietals, which makes them great food wines.

"Pinot Noir's 'barnyardy nose' or gamey, leathery smells and (common) flavors of wild mushrooms, berries, and red currants are all characteristics of this noble grape. Foods like venison, game birds, or tender beef steak served with a light wild mushroom sauce are automatically put into the Pinot Noir camp as safe partners.

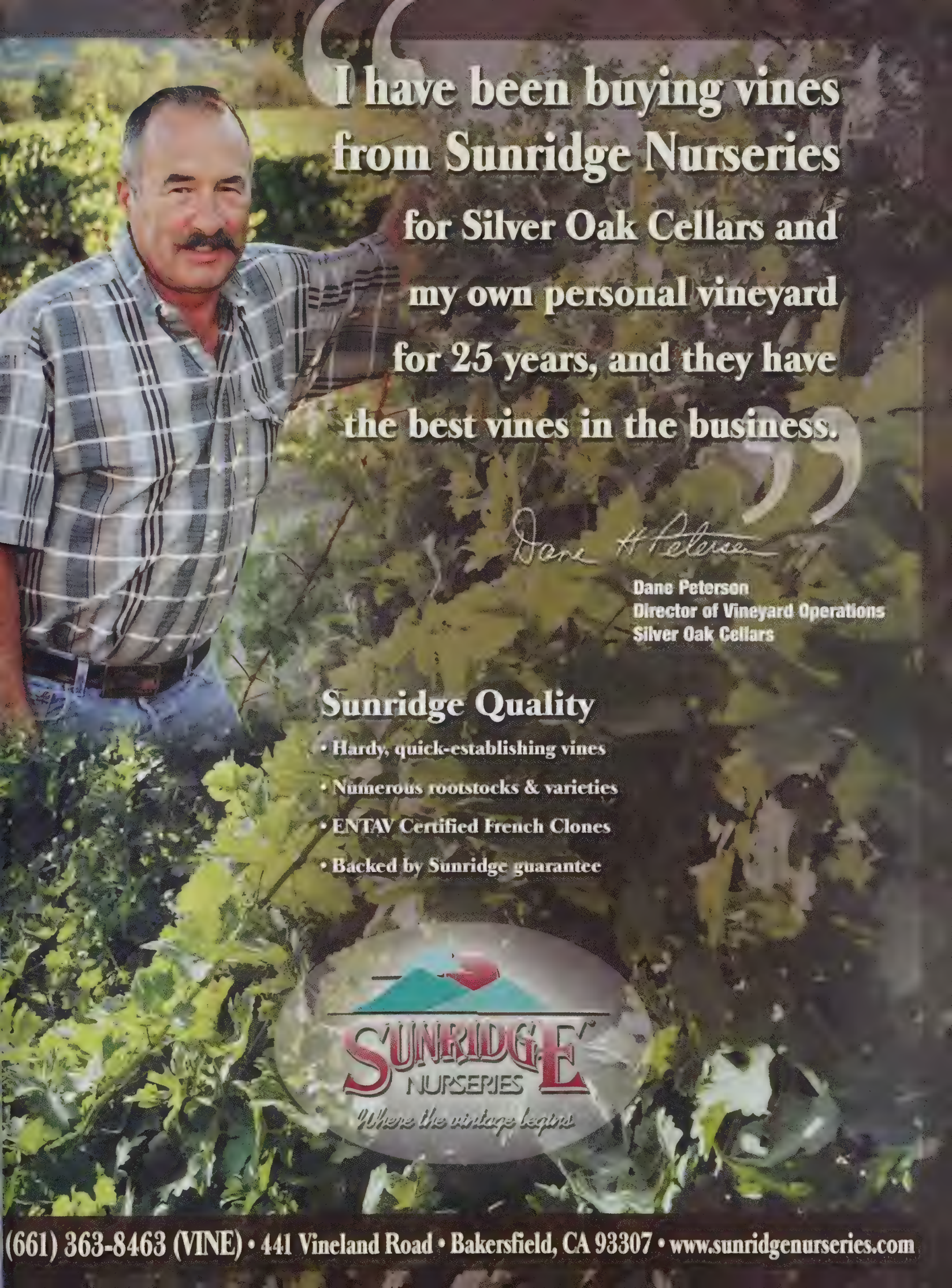
"However, there are a number of fish and chicken dishes that work really well with Pinot Noir as well — a subtle yet complex Mediterranean fish soup, for example, or roast chicken with root vegetables and gravy.

"Food and wine should complement one another, rather than contrast. When you put two wonderful tastes together and they combine in your mouth, the food and wine can really sing. Two good things together create something *exponentially* good, whereas contrasting flavors create a juxtaposition that is not guaranteed to take one to higher heights.

"I use this whole idea of weight and body as a background for wine and food matching. If the two elements have the same weight, they are more likely to be well-matched, but this is where the grape variety and wine style come in — and it can be a matter of preference. I tend to cook for the nuance of the wine — is it berries or barnyard or mushrooms? — and then take that cue for developing a dish or finding a good food match."

According to Langbein, the art of balancing wine and food to mirror and enhance one another is a deeply intuitive skill that anyone with a love of both can easily acquire. She believes her approach provides a framework within which you can freely create with confidence, knowing that your pairings will prove successful. It mirrors her own cooking style of using method-based recipes enhanced with culinary creativity and a palette of high-quality, natural ingredients.

Menu planning should also match food and wine from light to heavy, notes Langbein. She urges cooks to "forget about rules like 'white wine should go with fish and red wine with red meat,' and rather think about the complexity of the wine and food, think about how they weigh in comparison with one another. A nice medium-bodied Pinot Noir could go beautifully with a monkfish dish, for example, if it is complex and can equal the weight of the Pinot Noir." In other words, use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your creativity but keep it in the bounds of the balancing principle.

Langbein's approach comes from a commonsense experience that falls somewhere between innate ability and prodigious amounts of practical knowledge. She explains that most of her knowledge comes from entertaining friends and family and is based on her own personal experience and palate.

"My husband and I will be having a glass of wine before dinner, and I just start working from the flavors of the wine and end up creating fantastic dishes, all enhancing the qualities of that wine."

She sometimes creates a meal that goes with a certain type of wine and then has her guests all provide different bottles of that varietal. In this way, she discovered how much variation there can be in a particular varietal, and also what she wanted and received from wines, especially when pairing them with food.

These experiences educated Langbein about the importance of nuance and character and highlight the importance she places on food and wine being a bridge to strengthen kinship, friendships, and locality.

If you want to use Langbein's approach to create food and wine pairings of your own, you must rely on your own palate. Imagine the gamut of flavors running the spectrum, and choose foods and wines from that spectrum that are equal in intensity, body, and richness. Langbein declares that there are no wrong answers. If you keep your food and wine balanced and the combination is pleasing to you and your guests, then you have achieved success.

For a recent cooking demonstration, Langbein showcased a pairing of New Zealand lamb rack with Matua Valley 2003 Malborough Pinot Noir. The tastes did indeed equal one another in both weight and texture. The very mild lamb was finished with a chili-lime salsa with fresh mint. The selected wine match was from the Malborough region of New Zealand, an area made famous by Sauvignon Blanc but becoming increasingly well-known for its Pinot Noirs. The 2003 Matua Valley Malborough Pinot Noir has a full cherry nose that compliments the rich flavor of the lamb and a subtle finish of smoke that deepens the bright flavors of the chili.

Summing up the topic of Pinot Noir and its endless possibilities, Langbein declares, "Pinot Noir always gives you something to discover." ■

Annabel Langbein has provided PWV with her recipe for Mint Roasted Lamb Racks with Beetroot and Onions, and highly recommends Matua Valley Marlborough Pinot Noir to successfully echo its flavors. The lamb recipe is from her newest cookbook Cooking to Impress Without Stress. *Other cook-*

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books by Langbein include Savour Italy, *and* Savor the Pacific. *All three are published in the USA by Graphic Arts Publishing in Portland, OR. For more information, or to order Langbein's cookbooks, visit www.annabellangbein.com.*

MINT ROASTED LAMB RACKS WITH BEETROOT AND ONIONS AND SWEET AND SOUR MUSTARD SEED SAUCE

Serves 6. Preparation time: 10 minutes. Cook time: 50 minutes.

Make ahead: Make sauce up to one week ahead; brown meat up to 24 hours ahead.

Lamb racks fall into the category of low effort, high performance food. There's very little required to produce an utterly pleasing result. You can use this treatment with other lamb cuts — thick-cut leg steaks or rumps, for example. Well ahead of time, roll the lamb in mint and sear to brown. Make the sauce ahead of time and have the vegetables ready to cook.

4 racks lamb, trimmed (allow 3–4 cutlets per serving)
salt and ground black pepper
2 tbsp chopped fresh mint
a little oil to brown
6 whole, unpeeled onions
6 whole, unpeeled beetroot (beets)
1 tbsp maple syrup or honey

Season meat with salt and pepper and roll in mint to coat. Spray a little oil into a heavy pan set over a high heat and sear meat about 3 minutes or until well-browned all over. Cool, cover and put to one side or chill if not cooking at once.

Heat oven to 180°C/350°F. Place onions and beetroot in a roasting dish. Rub vegetables with a little oil and season with salt and pepper. Drizzle a spoonful of maple syrup or honey over beetroot. Roast 40 minutes or until tender, turning occasionally.

Place meat on a roasting tray, allowing space between racks, so the racks can cook evenly. Bake 12–15 minutes or until done to your liking. Cover and rest 5 minutes before carving.

To serve: Place 2–3 cutlets per person on a bed of minted shoestring zuchinni (see recipe). Accompany with sweet and sour mustard seed sauce (see recipe), roasted beetroot and onions. Pass bowls of green vegetables and roasted potatoes.

SWEET AND SOUR MUSTARD SEED SAUCE

This incredibly versatile sauce makes an ideal partner to most meats. It keeps for at least a week in the fridge and can also be frozen. If capsicums (bell peppers) are out of season, you can substitute diced red onion.

Cut up 1 red capsicum (bell pepper), seeds and pith removed, into 1-inch pieces. Heat 1 tbsp olive oil in a heavy pan and cook capsicum 1–2 minutes or until softened. Add:

½ cup sugar
1 cup red wine
⅓ cup red wine vinegar
2 tsp mustard seeds
1 tbsp dried currants.

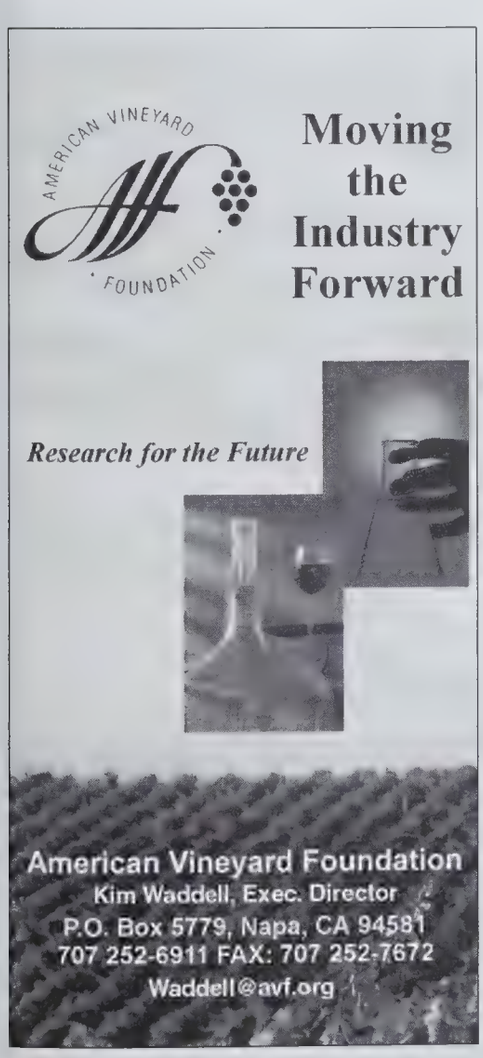
Bring to a fast boil. Simmer about 15 minutes or until sauce is reduced by about a third. Cool, cover, and chill if not using at once.

MINTED SHOESTRING ZUCCHINI

3–4 zucchini, cut in matchstick strips (a mandolin or Benriner slicer makes fast work of this)
6–8 mint leaves, finely chopped
1 tbsp olive oil
2 tbsp water
½ tsp salt
several grinds black pepper
finely grated zest of ½ lemon

Prepare zucchini and mint, cover and chill until ready to cook. Place in a heavy pan with oil, water, salt, pepper and zest. Stir-fry over a high heat 2–3 minutes or until just wilted. Serve at once.

Make Ahead: Slice zucchini up to 8 hours ahead and chill.



CUVAISON WINERY

Flexibility with movable fermentors and catwalks

BY Matt Hollis,
Taylor Lombardo LLP, Architects

A new Cuvaison Winery facility in the Carneros region of Napa County, CA, presented an opportunity for the design team at Taylor, Lombardo LLP, Architects (San Francisco, CA [formerly Brandenburger, Taylor, Lombardo]), and winemaker Steve Rogstad to collaborate in the creation of a building capable of accommodating multiple phases of the winemaking process within a common space.

ESTATE SELECTION
CUVAISON

Located in the center of a 392-acre estate, the 25,000-square-foot metal structure will host no formal tours. Its focus is instead on state-of-the-art features dedicated to producing top quality Pinot Noir and Chardonnay wines.

Sited on a stepped promontory surrounded by picturesque rolling vineyards, the facility's location negates the need to truck fruit from vineyards to a remote winery. Without the variable of time in transport, the winemaker is afforded complete control over temperatures during processing.

The site plan is based on a campus approach, with one rigid frame metal building structure to house all components of wine production and two smaller wood-frame buildings for staff offices and a laboratory. The choice of a metal building for the winery facility was a function of cost and efficiency.

Supplied by Soule Building Systems (Cotati, CA), the rigid frame structure is composed of standardized components within a custom design. A typical bay section represents a computer-optimized structural profile maximizing structural efficiency within a

Galvanized metal roof projects over the crush/receiving and press pad (left). Three flush-faced shed dormers above the fermentation floor correspond with the structural bays that support the punchdown system above the rows of open-top fermentors inside. Two ridge-mounted roof monitors allow diffuse ambient light to fall into the center of each barrel room (right).

Sunlight streaming thru three dormer windows where punch downs range from one to four per day. Once per day during cold soak, three to four per day from the onset of fermentation to ~0° Brix then one or none each day during extended maceration.

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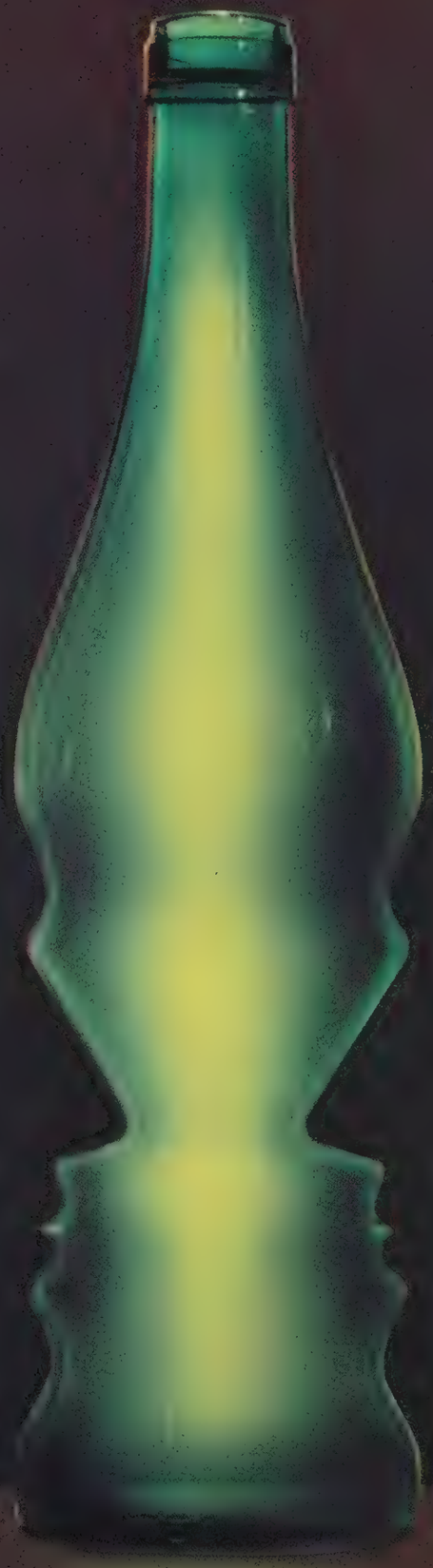

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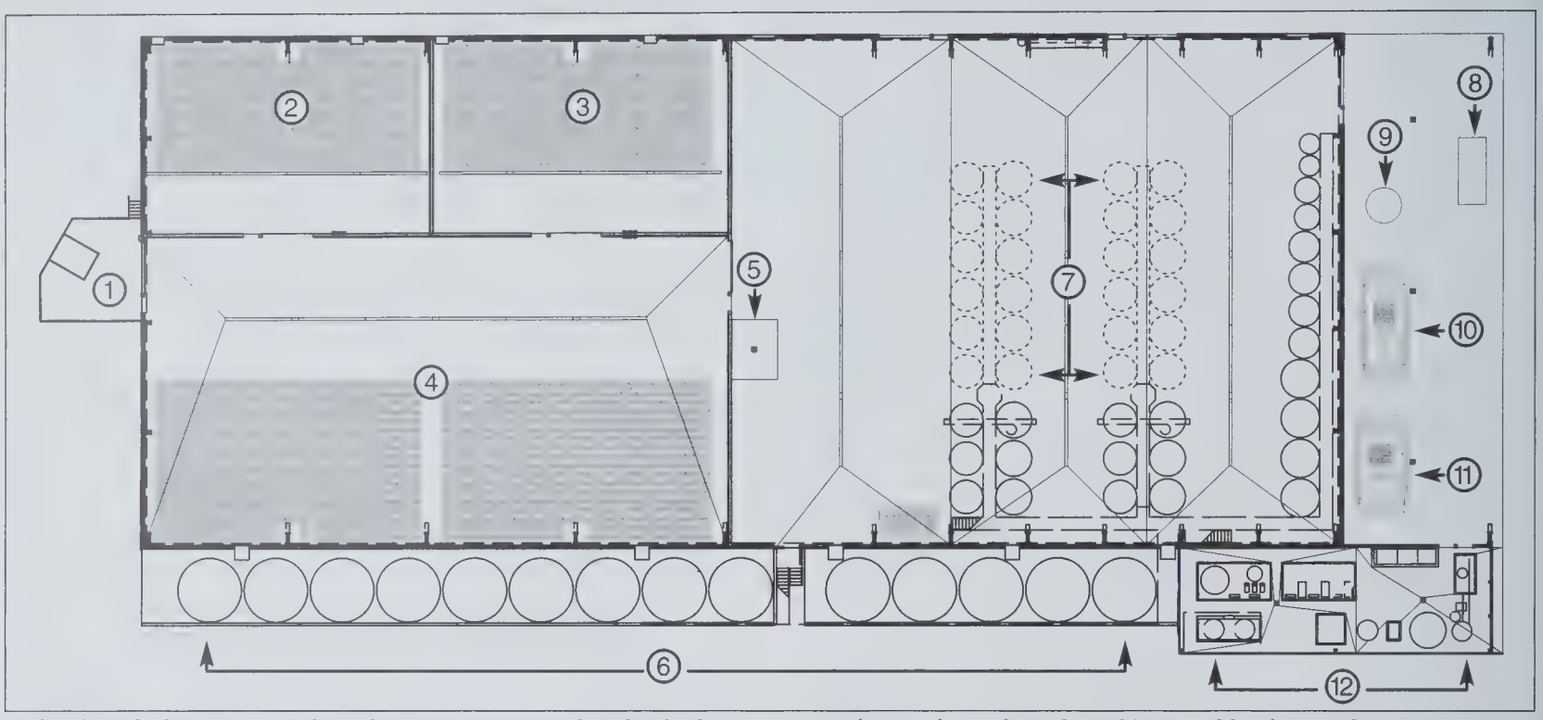
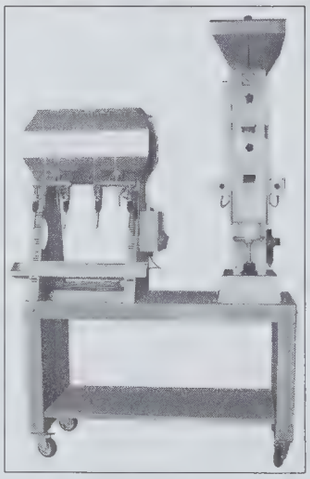


[1] loading dock; [2], [3], [4] barrel storage rooms with individual environmental controls; [5] barrel washing; [6] blending tanks; [7] movable fermentors and catwalks; [8] sorting belt and destemmer; [9] basket press; [10] tank press for whole-cluster white grapes; [11] tank press for whole-cluster white grapes; [12] mechanical equipment including a central glycol system with two storage tanks, one for cold glycol and one for warm glycol

Filling/Corking Machines



Entire unit is portable, with corking machine and model "Tivoli" linear gravity filling machine, with four spouts complete with electronic float.

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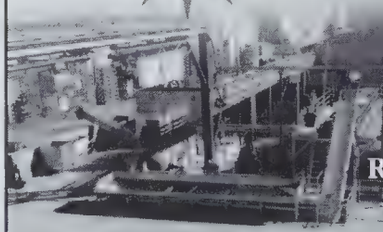

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minimum number of members. In addition, the rigid frame can be erected more quickly than other forms of construction, cutting costs significantly.

The metal building choice was also desirable from a maintenance perspective. The metal frame was coated with kestrel-blue protective paint to guard against corrosion normally associated with high humidity or prolonged exposure to sulfur and other chemicals. All exterior and interior walls sit on top of a four-foot concrete stem wall base. The stem wall provides an added measure of durability to protect against damage from errant forklift, scissor-lift, and automobile traffic.

The challenge was to design a building that did not look like a typical metal shed with an undistinguished exterior. The client wanted the winery and office space to fit in the rural location. Unlike many Napa Valley wineries, this building needed to reflect its function and look more like an agricultural barn than eye candy beckoning visitors.

The design team integrated shed dormers, roof monitors, clerestory windows, and other punched-openings to not only bring in an abundance of natural light, but to let the exterior suggest the function of the interior. For instance, the flush-faced shed dormers above the fermentation floor correspond to the structural bays that support the punchdown system above the open–top fermentors. Alternately, the ridge-mounted roof monitors (raised sections on the roof that contain clerestory windows) above the barrel storage rooms have a different appearance altogether as they allow ambient light to fall into the center of each barrel room.

The building style consciously straddles the line between contextually sensitive agricultural vernacular and a modernist high-tech box. The rigid, insulated polyurethane panel exterior walls atop the concrete stem wall are clad with Zaktique-finished corrugated metal sheets. While the corrugated metal recalls innumerable farm building precedents in the area, the Zaktique finish lends a certain slickness that hints at the top quality production facility within.

Because the prevailing design concept was for a production-only facility with little or no hospitality provisions for tours, the design maintains clean lines and a certain freedom from expensive interior finishes that would otherwise be necessary to conceal infrastructure. All plumbing, electrical, refrigeration pipe, and conduit routing are left exposed to maximize accessibility for maintenance and future expansion of the winery.

"The Cuvaison Carneros facility was designed primarily around the requirements of our Pinot Noir pro-

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gram, yet also to be able to efficiently handle our 180 acres of estate-grown Chardonnay," explains Rogstad. "Since our Pinot Noir all derives from our estate vineyard and comes ripe, more or less at the same time, we don't have the luxury of turning over fermentors two or three times each year as might be the case if our fruit came from different vineyards.

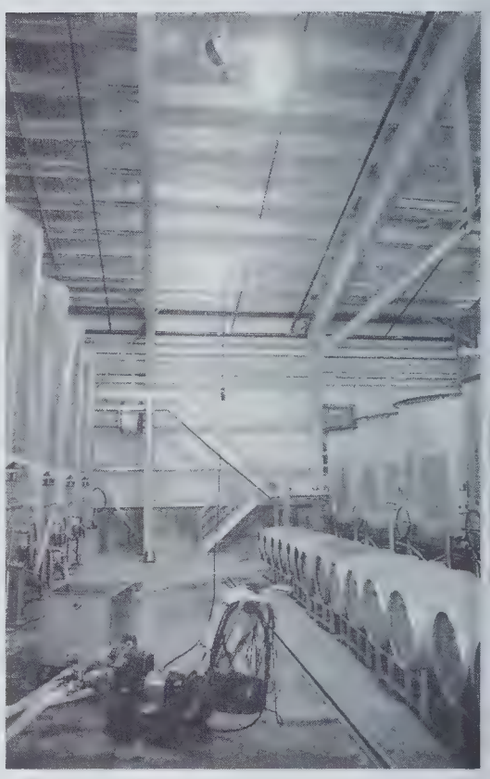
"We also wanted to be able to further divide individual blocks into smaller lots based on other vineyard factors such as vigor, aspect, and sun exposure. We have 36 open-top fermentors (5.4-ton and 6.7-ton capacity) that allow us to pick all of our fruit when and how we want to, without having to wait for open tanks. But to pay for this luxury in floor space, we chose to make 24 tanks portable, along with all of the associated plumbing and catwalk."

The tanks built by Modern Stainless & Design (Dayton, NV) have high-pressure dimpled glycol jackets and #4 finish polished stainless steel legs. Tank bottoms have a 1/2-inch per foot slope to facilitate removal of fermented grapes.

"By crafting a gangable catwalk system with quick disconnect electrical and glycol fittings, the majority of the tank room can be struck (like a theater set) after harvest, freeing up plenty of floor space for subsequent barrel work and bottling needs."

The fermentation room maximizes use of a ventilated, secure, well-drained space for multiple winemaking functions. Since the fermentation process takes only six weeks, most rooms dedicated to fermentation remain idle for most of the year. The Carneros facility employs movable fermentors and catwalks to create a room with greater flexibility and therefore, more bang for the buck.

When not in use, the tanks are moved by forklift, and the caster-mounted catwalks are simply pushed by hand to staging areas. Movable catwalks are facilitated by quick-disconnect couplings on the hard-line plumbing that runs underneath the grated walkways. Additional quick-disconnect couplings fasten to flexible tubes which supply tank jackets with both hot and cold glycol.



Barrel working takes place on the floor of the fermentation room. Ceiling-mounted reel provides easily accessible power supply to pump in foreground.

The final design consists of movable catwalks on casters, gangable in a variety of configurations to make room for other winery processing program components. Electricity is provided by means of a point grid of six ceiling-mounted retractable reels similar to those in an automotive shop. Hose stations are located around the perimeter of the room. Taylormade-brand floor-drains from New Zealand run the length of the tank aisles and generate less impact on forklift traffic trajectory than grated trench drains. Catwalks were oriented so that the aisles have direct access to exterior doors.

"In addition to a flexible floor plan, we wanted accessible services to make both

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To accomplish all this, a central glycol system, designed by Refrigeration Technology (Middletown, CA), makes hot or cold glycol instantly available. It features two storage tanks — one for cold glycol and one for warm — and four pipes (two cold, two hot) running throughout the building.

Having warm glycol available allows Cuvaison to heat the three barrel rooms as needed in the same way fermentor tanks are heated.

The source of the heat is hot water from the central hot water tank. Two loop pumps operate on-demand to heat the glycol, and a load pump supplies warm glycol to the fermentor tanks on a continuous basis. If hot glycol is accidentally pumped into the cold system, no harm is done. The control system detects this, and cold glycol is automatically returned to the warm system.

A valve station was installed for each tank, which allows switching from cooling to heating by opening and closing valves. The system uses RTI Super Stats to monitor the temperature of contents in a tank. The controls change from cooling logic to heating logic with the push of a button. The controls also have high and low temperature alarms to protect the wine.

Cuvaison designed two-thirds of the tanks and catwalks to be movable. This required a series of valves, unions, and quick disconnects for the plumbing and electrical.

repairs and design modifications easier and less costly to achieve," notes Rogstad. "We have hot and cold glycol plumbed all over the winery, for on-demand, simultaneous temperature control and hot and cold water. We also have compressed air and inert gas lines hard-plumbed throughout. We left much of the plumbing and electrical conduits exposed, but neatly racked for ease of entry.

"The idea of flexibility and impermanent structures carried over to other areas

Continued on page 71

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Multiple benefits in vineyard erosion control

BY Dawn Stimson,
Clean Water Project Coordinator,
Central Coast Vineyard Team,
Kris O'Connor, M.S., Director,
Central Coast Vineyard Team

Growers implement cover crop programs for a variety of reasons including erosion control, nutrient re-cycling, and dust control. New regulations, regarding water quality, provide added incentive to implement cost-effective cover cropping programs that effectively reduce vineyard erosion.

New water quality regulations

As part of the California State Water Resource Control Board's (SWRCB) Conditional Waiver for Agriculture Discharge, each of seven Regional Water Quality Control Boards (RWQCB) must develop a replacement waiver program that will protect water quality within its region.

The replacement waiver program was created by the SWRCB to replace the Agriculture Discharge Permit, which expired January 2003. The old permit allowed growers to discharge water from fields without restrictions. Each water board is required to develop a replacement waiver program for growers within its region that addresses the quality of water leaving agriculture areas.

As part of the replacement waiver program, growers are being required to complete a Farm Water Quality Plan that addresses several components of the farming operation and documents future practices to be adopted. On the Central Coast of California (Region 3), growers can complete a Farm Water Quality Plan through the University of California Cooperative Extension, or they can complete the Positive Points System (PPS) evaluation with the Future Plans Form from the Central Coast Vineyard Team (CCVT).[1]

The PPS evaluation presents a series of yes/no questions and addresses the "whole farming system" by reviewing six categories of farming practices. The grower must also document future plans for improving water quality by implementing best management practices (BMPs) on a particular site. (To see the Positive Points System and the Future Plans Form, visit www.vineyardteam.org.)

BMP practices were implemented along this road at a Santa Maria, CA, demonstration site to help reduce soil and water runoff, including road grading (to remove rills and gullies), seeding with fescues and Juan triticale (along the fence), and use of jute netting. (Photo by Marilyn Brooks)

Regardless of which farm plan growers choose to utilize — the UC Farm Water Quality Plan or CCVT's Positive Points System — they must develop a list of BMPs to deal with each of the four areas associated with irrigated agriculture's contribution to Non-Point Source (NPS) pollution: fertilizer, pesticide, irrigation, and soil management.

Each farm plan must include a list of BMPs that the grower will employ (or currently uses) to control erosion by reducing off-site movement of soil and water into nearby water bodies. In many cases, these are inexpensive and

Historically, this road cut (approximately seven-feet deep) eroded during the rainy season, depositing several feet of soil onto a nearby vineyard that had to be manually removed each year. BMP implementation included grading and planting of barley and fescues to reduce erosion and stabilize the area. (Photo by Dawn Stimson)

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Approximately 1.5 feet of soil built up along vines as a result of an eroding road cut uphill. (Photo by Dawn Stimson)

efficient practices that can save growers time and money.

Types of BMPs

BMPs are a combination of management, cultural, and structural practices that growers can implement to effectively control problems in the field. In regard to NPS pollution (related to agriculture), one area of BMPs includes practices that keep soil and water in place, thus controlling erosion.[2]

The SWRCB recommends several BMPs to reduce erosion in vineyards. Four are:

1. Cover crops — Cover crops can be planted in vineyards between vines to control erosion, increase infiltration, reduce soil compaction, and improve soil tilth, and to add organic matter and nutrients to the soil.

Cover crops (either annual or perennial) are usually planted in the fall, following harvest. Perennials or reseeding annuals can provide long-term protective cover lasting more than three years. Examples of commonly used cover crops in vineyards include erosion mixes (including various grass species and annual legumes):

- Zorro fescue (*Festuca megulura* fast-establishing annual grass);
- Clovers (Trifolium-legumes including rose clover [*Trifolium hirtum*], crimson clover [*Trifolium incarnatum*], and Persian clover [*Trifolium resupinatum*]); and
- Triticale (*Triticale hexaploide* fast-growing annual).

In addition, cover crops can support populations of beneficial insects, which is important in promoting biological diversity within a vineyard.

2. Filter strips — Filter strips are planted parallel or adjacent to vineyards or along waterways to slow and reduce run-off and remove sediment and pollutants through infiltration. They can also enhance wildlife habitat

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Kevin Merrill, vineyard manager, in a newly planted demonstration block with a perennial erosion cover crop mix (crimson clover, rose clover, subterranean clover, medic, Persian clover, dwarf perennial ryegrass, and fine fescues) drilled at 35 lbs./acre. (Photo by Dawn Stimson)

when native species are used. Planted with dense vegetation in areas between five and 10 feet wide, filter strips can include grasses, such as tall fescue (*Festuca arundinacea*), switch grasss (*Panicum virgatum*), creeping wildrye (*Leymus triticoides*), and blando brome (*Bromus hordeaceus*).

3. Tree/shrub establishment — Trees and shrubs are commonly planted along bare hillsides of vineyards to reduce erosion by increasing water penetration and infiltration rates. They can also enhance wildlife habitat. Trees and/or shrubs can be planted any time during the year, but they may require additional irrigation if not planted prior to winter.

4. Land smoothing — Removing rills and gullies on land surfaces with earth-moving equipment can reduce erosion and improve water drainage and water distribution. Land smoothing is usually conducted prior to planting or construction. The work usually requires the use of scrapers, land levelers, and backhoes. Land smoothing can be costly, but most of the time the benefits outweigh the costs. Smooth land is easier to plant and less likely to erode.[3]

Growers frequently spend significant time and money each year taking corrective action to mitigate existing problematic field conditions, such as sediment build-up at the end of bare roads, rills, and gullies and large amounts of water run-off, which can carry nutrients and pesticides into nearby fields and water bodies. For example, many growers use the following techniques every year:

- Sand bagging — Anticipating winter rains, some growers place sandbags at the bottom of roads and hillsides to prevent erosion.
- Road re-grading — Every year growers must re-grade bare roads that were wiped out during the rainy season.
- Sedimentation removal — Large amounts of soil and sediment can build up at the end of bare roads and hillsides when proper cover is not placed on a surface. Growers must then remove the soil every year after the rainy season.

Unfortunately, these costly efforts must be repeated every year, and they don't correct the problem. BMPs are longer-lasting solutions that can save growers time and money.

Clean Water Project

In 2002, the CCVT, a non-profit vineyard grower group on the Central Coast of California (Monterey, San Luis Obispo, and Santa Barbara counties), received a three-year Clean Water Act, Section 319(h) Grant for Water Quality Implementation Projects administered through the SWRCB. Goals of the grant were to reduce, eliminate, or prevent NPS water pollution resulting from agricultural run-off and to enhance water quality in impaired water bodies.

Funds available through the 319(h) program were directed toward demonstration projects that would achieve these goals.[4] CCVT developed the

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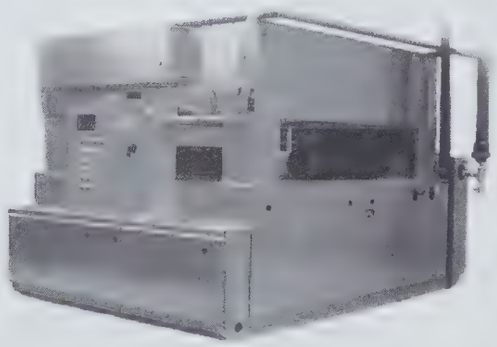

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Clean Water Project to assess and reduce non-point source pollution from Central Coast vineyards through the implementation of BMPs.

As part of the CCVT Clean Water Project, ten demonstration sites were established at vineyards between Monterey and Santa Barbara counties to demonstrate the effectiveness of BMPs in reducing soil and water run-off. For example, a demonstration site was established at a vineyard in Santa Maria, CA, which was located inland on slopes ranging from 5% to 15% with Betteravia Loamy Sand, dark variant. Previously, the vineyard manager had problems with the roads eroding within the vineyard due to rains and lack of cover crop.

"In years past, we regraded and refilled the sandy roads after the rainy season," states Kevin Merrill, vineyard manager. "Graders, scrapers, and bull-dozers were used to smooth the roads and re-allocate excess soil at the bottom of the roads." He estimates that between $10,000 and $15,000 were spent annually for this work.

Table I. Implementation costs for Best Management Practices (includes management, labor, equipment, and material costs).

Demo BMP	Implementation Costs ($/ac)		
	Year 1	Year 2	Difference
Grading, grassed roads, use of jute netting	$642.50	$199.75	-$442.75
Filter strip and cover crop	$352.48	$314.88	-$37.60
Grassed roads	$112.60	$118.33	$5.73
Cover crops in vine middles	$210.25	$300.75	$90.50
Cover crops under vines and in middles	$152.88	$30.00	-$122.88
Grassed roads and use of jute netting	n/d	$128.70	n/a
Cover crops in vine middles	$41.70	$40.20	-$1.50
Cover crops in vine middles	$347.50	$347.50	$0.00
Grassed roads	$150.80	n/d	n/a
Water diversion, cover crop, grassed road	$129.13	$100.00	-$29.13
Grassed roads	n/d	$121.40	n/a
Average	**$237.76**	**$170.15**	**-$67.20**

In 2003, Merrill (with help from the Cachuma Resource Conservation District [RCD] and CCVT staff) implemented several BMPs to reduce soil run-off and to reduce costs. The RCD

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Table II. Estimated changes in soil loss at Clean Water Project demonstration sites using the RUSLE2 model.

Demonstration Practice	Estimated Soil Loss from Demonstration Area (ton/ac/yr)		
	Without Demo BMP	With Demo BMP	Difference
Grading, grassed roads, use of jute netting	32.50	0.75	31.75
Filter strip and cover crop	24.50	0.90	23.60
Grassed roads	42.00	0.21	41.79
Cover crops in vine middles	7.00	5.75	1.25
Cover crops in under vines and in middles	2.35	0.22	2.13
Grassed roads and use of jute netting	20.00	1.00	19.00
Cover crops in vine middles	3.87	2.67	1.20
Cover crops in vine middles	3.00	1.50	1.50
Grassed roads	17.00	2.00	15.00
Average:	**16.91**	**1.67**	**15.25**

*Two of the sites did not meet the RUSLE 2 requirements for calculations and therefore could not be included in this table.

was chosen for its experience with local erosion issues. RCD staff helped Merrill select the following BMPs for the site:

- Smoothing and leveling roads;
- Planting grassed roads; and
- Planting filter strips.

In the summer of 2003, roads were smoothed over an area equivalent to 10 acres. Gullies and rills were removed. Following harvest, the roads were seeded to establish cover crop and reduce runoff. A mix of sheep fescue (*Festuca ovina*) and hard fescue (*Festuca longifolia*) was selected because of its drought tolerance, longevity (as a perennial), and deep-rooting properties. The fescue mix was drilled along the roads at 30 pounds per acre (lbs/acre).

Straw was spread on top of the road at one ton per acre (approximately one to two inches deep) to secure the seeds against the first rains. In one area more susceptible to erosion, jute netting was secured on top of the road for additional support to the seeds. Along the fence beside a couple of roads, triticale was planted as a filter strip to slow water run-off from the adjacent property. Triticale was selected because of its early ripening and large yielding capacity and was broadcast at 90 lbs/acre.

BMP benefits at project sites

Many benefits were evident through implementing selected BMPs

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along these demonstration roads: an increase in cover from 10% to 75%, a reduction in soil leaving the roads, and reduced re-grading expenditures.

Total cost to implement BMPs at this site was approximately $1,500 ($150/acre), including seed costs, implementation, and maintenance. This cost was considerably lower than the approximate $10,000 spent annually on grading and staff time. In addition, BMP benefits can last for two to four years.[5]

At another vineyard in Los Olivos, CA, a demonstration site was established along a highway on slopes ranging from 9% to 15%. The area was subject to large amounts of runoff from nearby hills. In years past, run-off removed Elder Sandy Loam soils from the vineyard and deposited them onto the road below. Sandbags were placed around the vineyard before the rains, and then excess soil was removed from the bottom of the vineyard. Average cost was between $500 and $1,000 per year.

As part of the Clean Water Project, a 50-acre parcel within the Los Olivos Vineyard was established as another demonstration site. Following harvest in 2002, BMPs were implemented to reduce and infiltrate run-off through the site. Staff from the Cachuma RCD helped develop a work-plan to determine which cover crops would work best to reduce run-off and be most cost-effective.

The area was divided into four blocks. One block was drilled with 35 lbs/acre of Perennial Erosion Mix[6] of crimson clover, rose clover, subterranean clover (*Trifolium subterraneum*), medic (*Medicago*), Persian clover, dwarf rye grass, and fine fescues. Another block was drilled with 35 lbs/acre of Drought Annual Mix (crimson clover, rose clover, subterranean clover, medics, Persian clover).[6] A third block was divided in two sections. The upper most half of the block was drilled with 80 lbs/acre of Juan triticale (*Triticosecale Wittm*). The lower half of the block was drilled with 10 lbs/acre of Zorro fescue, as was the fourth block.

Benefits of implemented BMPs were seen in each of the subplots. The Perennial Erosion Mix grew to heights of eight to 12 inches and covered about 85% of the planted area. The Annual Erosion Mix grew six to eight inches in height and covered about 50% to 60% of the area. Juan triticale grew to 18 to 36 inches in height and covered almost 90% of the planted area. Zorro fescue grew four to six inches and covered about 50% of the planted area (lack of better establishment may have resulted from insufficient rain after planting).

Total cost to implement and maintain BMPs at this site was approximately $2,000, or $40/acre. This included the cost of seeds, two-thirds of which were perennial and would re-seed annually up to five years. In addition, the cost for the Juan triticale (the most effective) was minimal ($0.30/lb) and could easily be replanted yearly if needed.

In the Clean Water Project as a whole, the average cost to implement best management practices decreased from $237.76/acre to $170.15/acre from Year 1 to Year 2 (Table I) for vineyards participating for multiple years. At some sites, costs remained constant or increased, due to the type of practices implemented or problems with establishing cover during the first season. But for the most part, growers were pleased with the cost-reduction and cost-effectiveness of the practices.

Estimated soil loss reductions

In the second year of the Clean Water Project, CCVT staff worked with the Templeton Natural Resource Conservation Service staff to estimate soil loss prevented from demonstration sites using the Revised Universal Soil Loss Equation (RUSLE) 2.

RUSLE 2 is a computerized model used to plan conservation practices; it provides an estimate of soil loss in tons per acre per year (tons/acre/year) that would occur with various practices. The equation considers five factors: climate

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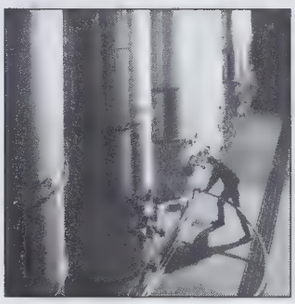

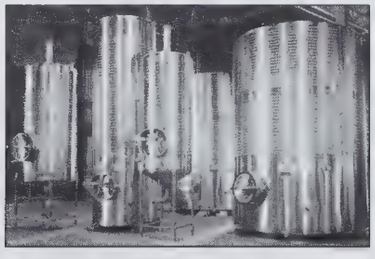
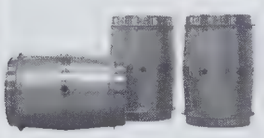

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(precipitation and temperature); soil type (series); slope; crop management (equipment used); and conservation practices (sediment basins, cover crops, etc.).[7]

By using the RUSLE 2 model, CCVT estimated that, without implemented BMPs, soil loss ranged from 2.35 to 42.0 tons/acre per year at demonstration sites. With implemented BMPs, soil loss ranged from 0.21 to 5.75 tons/acre per year. On average, project staff estimated that the implemented BMPs reduced soil loss by 15.25 tons/ acre per year (Table II).

Ripple effect

Demonstration projects such as the Clean Water Project help growers see the specific costs and benefits of implementing BMPs, in addition to learning the "how-to" for specific practices.

By providing technical assistance and documenting specific project information, the Clean Water Project capitalizes on the growers' willingness to adopt new practices and leverages their contributions of time and resources.

Growers provide a living laboratory that helps develop information that can be extended to a broader audience. This paves the way for more growers to adopt similar practices with less risk because of lessons learned in demonstration projects. With the current Agriculture Discharge Waiver in place, such lessons will help growers be successful in adopting BMPs that protect water quality. ■

Further Reading

"Conditional Waiver of Waste Discharge Requirements for Irrigated Lands" at http://www.swrcb.ca.gov.

"Non-Point Source (NPS) Pollution and Best Management Practices (BMPs)" at http://anrcatalog.ucdavis.edu or http://www.nrcs.usda.gov.

"Central Coast Vineyard Team's (CCVT) Clean Water Project (CWP)" at http://vineyardteam.org/ or contact Dawn Stimson; Clean Water Project Coordinator at 805.369.2288 or via email at dawn@vineyardteam.org.

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Glenn McGourty. "Cover Cropping Systems for Organically Farmed Vineyards." *Practical Winery & Vineyard*. September/October 2004.

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3. University of California Cooperative Extension and USDA Natural Resources Conservation Service. (2003). "Farm Water Quality Planning Short Course — Water Quality Information." Estrella River Watershed, San Luis Obispo County, February 2003.

4. "319 Program Fact Sheet." (2003). www.swrcb.ca.gov/nps/docs/fldpl319.doc. (July 26, 2004).

5. Huebner, G. "Forage and Grass Seed Production Guide 2002" (2001). www.forageseed.mb.ca/ProductionGuide.html. (July 20, 2004).

6. Seed mixes were purchased from Lockwood Seed and Grain located in Chowchilla, CA.

7. "Revised Universal Soil Loss Equation, Version 2 (RUSLE)." (2004). http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm (November 2003).

New Cuvaison facility

Continued from page 61

of the facility, such as the barrel room, where barrels are stacked on movable barrel pallets. This allows us to shuffle fermentation lots through any of three independently controlled environments. Access to the rooms is provided by high-speed fabric roll-up doors. The rooms themselves were designed with enough clearance to accommodate a five-high, tight-pack storage strategy."

Flexibility and mobility can also be observed in the crush pad equipment. A pneumatic bin dumper and incline sorting table/destemmer combination may be readily maneuvered in a variety of configurations inside or out, depending on the crush strategy for a given season. Depending on the weather, crush pad area drains may be switched from accommodating process wastewater to stormwater.

The south exterior facade of the building is dominated by a row of 10 blending tanks — 12 feet in diameter, 17 feet high — with space for seven more tanks. Tank temperature is maintained by means of rigid-insulation cladding. Thus, valuable interior floor space is reserved for the more flexible programs mentioned above.

"Much like the Cuvaison Vineyards Estate-grown wines, we wanted the winery to accent the beauty of the vineyard and not the other way around," adds Rogstad. "An example of this effort was to use a compact, activated sludge system for treating our process wastewater in lieu of a two-and-a-half acre dual wastewater pond. Our 'Techqua' unit spares valuable vineyard acreage and allows us to process up to 10,000 gallons of wastewater per day during harvest, which after treatment, is recycled back onto the vineyard via drip irrigation. The 140,000-gallon fire protection water tank serves a dual purpose by also storing the settled wastewater before its return to the vineyard."

The single-story office and laboratory buildings were kept separate from the 34-foot-tall winery proper in order to humanize the scale of the production facility and take advantage of the gorgeous site. The wood-framed structures reference their much larger metal neighbor with their galvanized metal roofs, yet maintain a sense of individual identity with avocado green stained board-and-batten siding. The winemaker's office enjoys a catbird seat's view of the entire campus, while other offices and break areas command similar views of surrounding vineyards.

By working in close partnership during the planning phase, winemaker, architect, and general contractor were able to design/build a winery tailor-made to Cuvaison's needs. ■

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Architect: Taylor Lombardo LLP
General Contractor: James Nolan Construction, Inc.
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WARMER VINEYARDS AHEAD

BY Dr. Richard Smart

One thing we do know about the future is that it will be warmer. Projections about global warming are now widespread, rather than being limited to a few scientists. One of the first people I heard discuss this was my former Cornell University professor Ed Lemon. He made significant studies in crop microclimatology and photosynthesis, and was well aware of the impact increasing CO_2 concentration in the atmosphere was having on the earth's temperature. These projections were first floated in the early 1970s, but are now widely accepted.

The United Nations Environmental Programme and the World Meteorological Organization formed the Intergovernmental Panel on Climate Change in 1988 to assess scientific, technical, and socio-economic information to understand climate change. For more information about global warming, visit the agency's web site at www.ipcc.ch.

How will global warming impact the wine industry? Studies of this are occurring already. The net effect is that coastal vineyards in California will experience the climate of areas now further inland, and valley vineyards will experience the climate of those further south. We do not have long to wait, as *global warming is already happening*.

I was reminded of this in Slovenia recently, when a colleague showed me a comparison of temperatures in the last two decades, which show significant change. In many of the areas I visit, I hear of record high temperatures now occurring. Armed with this data, it seems we might have to believe some of the old-timers who insist that the climate is changing!

Implications of warmer vineyards

We all know that temperature is the most important climate component affecting grape composition and wine quality. In general, most vines produce wines with better varietal definition at lower rather than higher temperatures. Night-time temperatures are important as well as day time, although I am not sure which is the most important. Warm days and cool nights seem to be preferred.

As temperatures increase, sugar accumulation is favored, and acidity is lower with higher pH. Red wines also have better color at lower temperatures. Further, most white varieties are better-suited to cooler rather than hotter temperatures.

There is a strong relationship between temperature and optimal quality of any given variety. Some varieties will only make decent wine in cool climates — Pinot Noir is a good example of this. Yet its nearby Burgundy companion Chardonnay can be grown over a wide range of temperatures to produce commercially acceptable wines. Among the red varieties, Syrah is better-suited to high temperatures than Cabernet Sauvignon.

Dr. Smart receives Innovation Award from *Wine International* (see page 137).

One might argue that warm-to-hot California Central Valley vineyards are already planted to some inappropriate varieties. For example, Cabernet Sauvignon is in excess supply in hot regions of both California and Australia. Among other things, this suggests poor sales because of concerns over quality. We might wonder how many other varieties grown in hot regions are basically unsuited.

The dilemma, of course, is that we have a wine market driven by varietal labeling, so producers are obliged to grow the same variety over a range of price points and locales. This commonly involves planting varieties in hot regions where they are unsuited.

This is a marketing problem, and the Austrian solution I have observed is useful. Producers of a region got together to

Dear Editor:

I read with interest "Smart Viticulture" in the September/October–2004 *PWV*. While Dr. Smart presents his opinions on ripening, many of which are controversial, he states, "A tip for enologists: A better guide for wine quality can be the proportion of growing shoot tips at veraison, and the timing and speed of veraison. Watch that, rather than tasting grapes near harvest."

Can he amplify that statement by presenting, to the best of his ability, growing shoot tip proportions and speed of veraison. I understand that there are many variables, but he has left readers up in the air.

John Lanza Bree
Sutter Ridge Vineyards
Sutter Creek, CA

Dear John,

Thanks for your letter. I will present (to the best of my admittedly limited ability) a whole column on this subject. My remark was meant as a "teaser," and, by golly, it seemed to have worked!

By the way John, do you see being "controversial" as negative or positive? It seems to me that it is positive. All new ideas, some of which turn out to be correct, are "controversial."

Good luck,
Richard Smart

decide on a suitable "brand" name and an appropriate mix of regionally based varieties to constitute the wine. The proportions of each variety have been designated, but with wide tolerance. This way, producers are able to develop their own interpretation of a common theme, yet all contribute to promotion and marketing of the common name.

This was not the first time that a style name was coined in the wine industry — think of Meritage, attributed first to Robert Mondavi, or "Classic Dry White," which was introduced by a number of Western Australian producers.

Varieties suited to hot regions

There are varieties, both red and white, suited to hot regions. Naturally, they have their origins in warm parts of the world rather than the cool temperate climates of France, where most of our currently fashionable varieties originate.

In my travels, I come across many interesting varieties, and I have listed–some below that are suited to warm climates. This is not an exhaustive list, but merely a few I have noted. They include, for the reds:

1. Agiorghitiko from Greece, which produces full-bodied styles,
2. Alicante Bouschet, a long discarded tenturier variety, now having a renaissance in the Alentejo (Portugal) as a quality wine grape,
3. Baga, a tannic Portuguese variety, which may be suited for blending,
4. Blaufrankissch or Limberger from Austria, which performs well in Washington state and the Central Coast of California,
5. Bobal, a Spanish variety with good color,
6. Petite Syrah or Durif, which performs well in hotter parts of the Central Coast,
7. Graciano, a Spanish variety, now being planted more in warmer parts of Spain than its homeland of Rioja,
8. Limnio, from Greece, reputedly full-bodied and with good acid,
9. Nero d'Avola, a wonderful Sicilian wine of the Syrah style,
10. Petit Verdot — although from Bordeaux, it is very well-suited to hotter climates where it is making outstanding wines,
11. Raboso from Italy, which produces tannic wines in hot climates,
12. Tempranillo from Spain, which produces its best wines in cooler climates but is now being grown in hotter parts of Spain, and,
13. Touriga Nacional and Touriga Francesa, from Portugal, producing excellent quality red wines in hotter regions.

Here are some suggestions for whites suited to warmer regions:

1. Arneis, Italian scented variety, does well in warm parts of California but remains unproven in hot regions,
2. Fernao Pires, Portuguese white with lots of promise in warm climates but can be tried in hot,
3. Inzolia, a Sicilian white that performs well in the heat,

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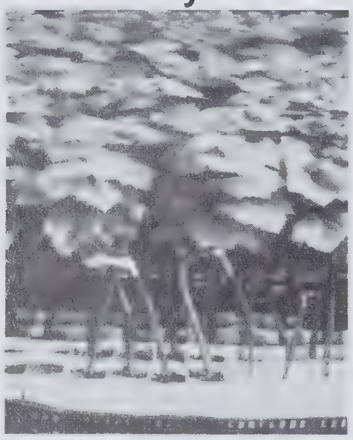

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4. Semillon, which can make fresh whites in hot climates,
5. Torrontes, from Argentina, a Muscat variety,
6. Verdejo, from Spain, excellent in warm, to be tried in hot climates,
7. Verdelho, a Portuguese variety used for fortified wine but being found suitable for quality wine in hot parts of Australia,
8. Vermentino from Italy,
9. Viognier, from the Rhone Valley of France, now showing its potential in hotter parts of Australia and California.

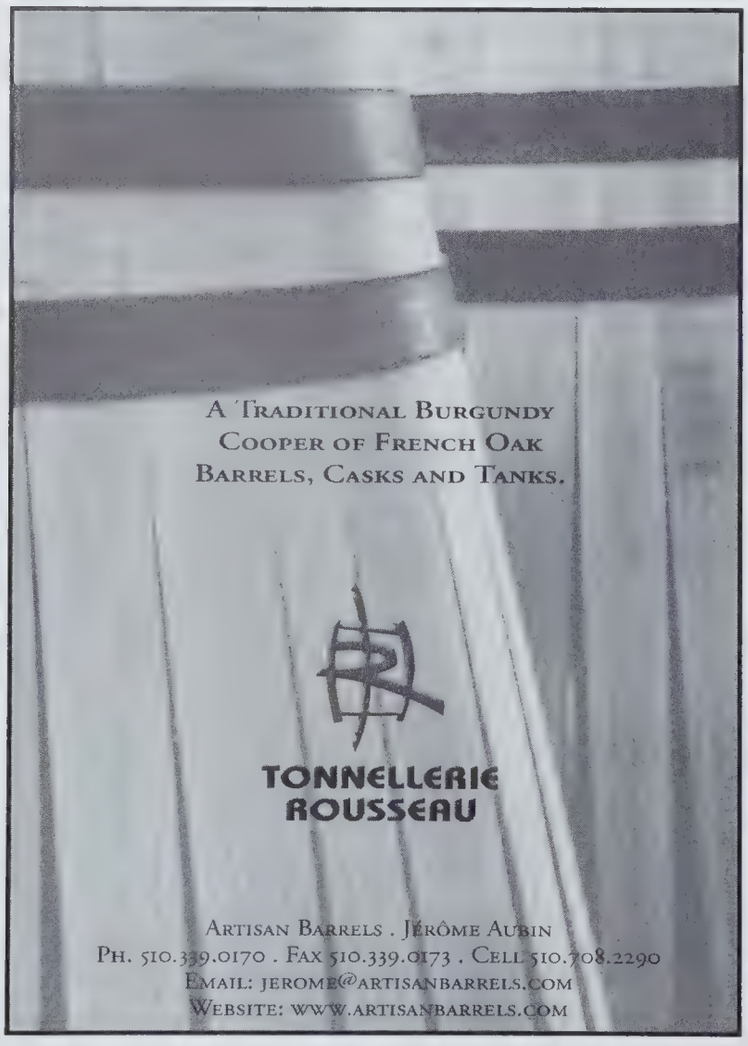
I wonder how many of these and other varieties are now being tried in hotter areas. Unfortunately, it seems that most variety-related research these days has to do with genetic manipulation, rather than with evaluating the attributes — such as heat tolerance — of varietals we already have. I for one remain skeptical of the benefits of the "in fashion" research and would prefer to see more effort devoted to preparing for the effects of global warming.

Cooling warm vineyards

I was in the Sunraysia region of Australia recently, which has a hot and arid climate like the middle of the Central Valley in California. There, several producers are using sprinkler irrigation to cool vineyards. They are being operated intermittently during the hot part of the day and into the early evening. These systems are being installed in addition to drip irrigation, so the cost is almost double, but early adopters claim encouraging results.

Recently, I was able to find, in my archives, a 1973 UC Davis Extension report on "Heat suppression in vineyards using over-vine sequential sprinkling." Researchers found that sprinklers could drop air temperatures 7 to 10°F, while also increasing humidity 10% to 20%. Low salinity water is required. Their study

Continued on page 137



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INTERVITIS/INTERFRUCTA 2004

Intra-row vineyard spacing and soil management, Long-term field trial results with Cv. Pignoletto

BY Cesare Intrieri, Ilaria Filippetti, Giuseppe Lia, Emilia Colucci, Dipartimento di Colture Arboree – Cattedra di Viticoltura – Sezione Viticola del Centro Interdipartimentale di Ricerche Viticole ed Enologiche, Università di Bologna.
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Researchers at universities in Bologna and Piacenza, Italy, partnered to study the effects of a variety of soil floor management techniques and vine-row spacing on vine growth and yield and on grape quality. The subject vineyard was a GDC-trained "Pignoletto" (*Vitis vinifera L.*, which produces a pale, delicate white wine) vineyard planted in a hillside area at the Terre Naldi Agricultural Holdings near Faenza (Ravenna) in 1992. Study data include two periods, the vineyard establishment phase from 1993 to 1994 and the subsequent full cropping period from 1996 to 2000.

The experimental layout contained four blocks with five different strategies of vineyard floor management including full tillage (FT), full sward (FS) as an alley sward combined with either under-the-vine tillage (TS), plastic mulch (MS), or herbicide (HS), and in-the-row vine spacing of 30 inches (75 cm), 40 inches (100 cm), 50 inches (125 cm), and 60 inches (150 cm) between vines.

Canopy filling was 56% for FT at the end of the 1993 growth, followed by MS (29%), TS (20%), HS (14%), and FS (0.4%). Quite surprisingly, canopy filling was slightly lower in the 30 inch spacing compared to others, as a result of root competition.

Edited from a presentation to the Quality Management in Horticulture and Viticulture Symposium at Intervitis Interfructa, Stuttgart, Germany, 10–11 May 2004.

Few interactions between floor management and intra-row vine spacing were found over the 1996 to 2000 full cropping period, although floor management was definitely more effective in modifying vine performance. Vine vigor (pruning weight basis) was reduced in FS by about 30% compared to FT with the remaining treatments producing intermediate results.

Yield varied from 4.61 kg/m (23 t/ha = 9.3 t/acre) in FT to 3.34 kg/m (16.5 t/ha = 6.7 t/acre) in FS with final grape quality affected accordingly (FT had 1.8 less Brix and higher TA than FS on the five-year time span) and other treatments having intermediate values.

Vines spaced approximately 30 inches apart in the row had 23% higher pruning weight per meter than vines 60 inches apart, whereas yield and grape quality were not substantially affected.

A significant interaction between floor management and vine spacing occurred for leaf area per meter of row, showing a marked decline at increasing distances in the weaker treatments (FS and HS) and a flat response for the remaining ones. Data highlight the strength of floor management as a tool to condition both dynamics of vineyard establishment and balance of mature vines.

Vineyard soil-management practices in both Italian and French viticulture show an increasing trend towards grassing.[2,3,5,6,7,9,10,12,17,18,1,4,13] Swarding techniques have increasingly replaced textbook tilling operations, especially in the tractor row,[20] and their undoubted advantages appear to outweigh drawbacks.[9] Drawbacks largely concern greater water competition and the phenomena involved in poor must fermentation associated with a lack of nitrogen.[11]

Yet, it must be noted that vineyard grassing is still mainly understood as wild grass cover,[17] which tends to promote more aggressive native species at the expense of the flexibility that specifically chosen grasses can afford.[29] In effect, such species-specific swarding may be better adapted to a given environment's water and nutrient supply and to vine growth and yield performance.

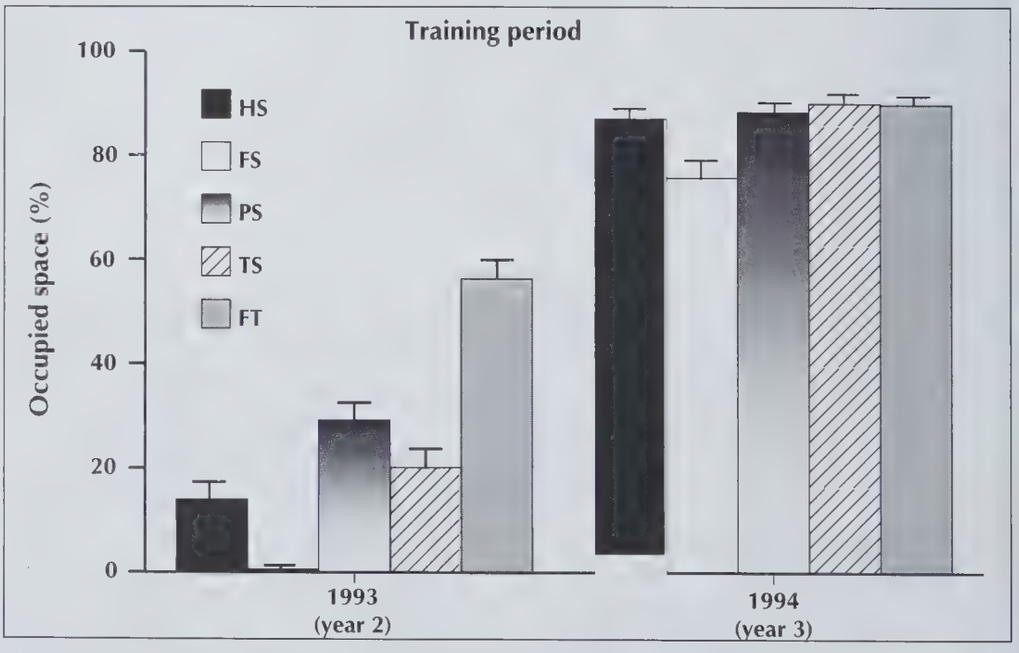

Figure 1. Percentage of filled trellis space determined at the end of the 2nd and 3rd growing season for each soil management treatment. Data pooled over intra-row spacing levels. Vertical bars indicate 2x standard error.

Plant material and experimental design

Pignoletto (sin. Grechetto gentile) was grafted to SO4 rootstock planted in 1992, and the sward was sown in October of the same year using Agrostis tenuis (25%), Poa pratensis (25%), Festuca ovina (25%), and Festuca rubra (25%) in terrain having an average soil profile of 25% sand, 50% loam, 25% clay with 1.1% organic matter, 0.8% total N, 7.6 ppm total P, and 131 ppm exchangeable K. Soil hydrological constants were 33% for field capacity and 15% for wilting point.

The vineyard was trained to a Geneva double curtain (GDC) trellis at a constant between-row spacing of 13 feet (4 m) or 1.24 miles of productive cordon/acre (5km/ha = 3.11 miles/ha) and divided into four blocks of 10 rows each with at least one row per plot randomly selected for a given soil management regime.

Vines were planted in random plots between two posts (40 feet of cordon) at approximately the following spacing: 30 inches (59 inches of cordon per vine, or 3,333 vines/ha); 40 inches (79 inches of cordon per vine, or 2,500 vines/ha); 50 inches (98.5 inches of cordon per vine, or 2,000 vines/ha); and 60 inches (118 inches of cordon per vine, or 1,666 vines/ha).

The experimental design was a split-plot with five levels for the plot factor (soil management) and four for the split (intra-row spacing), for a total of 20 treatments; four vines per treatment (sub-replicates) were monitored, for a total of 80 trial vines.

The under-the-vine strip was treated with herbicide, mulched, or tilled plots covering about 15 inches on either side of the vines. Black polyethylene film was used for mulching; Roundup was used for weed control. Nutrient inputs were limited to no more than 44 lbs N/acre (50 kg N/ha) distributed annually in spring over the entire area.

The double curtain's permanent cordons were split by tipping one of the main shoots trained from the ground during the second year from planting (1993) and promoting the growth of the two distal laterals. Full-cropping pruning began in February 1996, by leaving a constant node number (4 to 5 spurs of 3 to 4 count nodes) per linear meter of cordon. Semi-automated shoot combing was performed every year prior to bloom, followed by mechanical topping of the same downward arched shoots at 20 to 24 inches above ground.

Parameters monitored

Training period (1993–1994)

The length of all laterals and sub-laterals and, separately, of the two main laterals (usually the two distal ones) was measured on each vine at the end of Year Two of growth (1993). The amount of space occupied by the skeletal vine structures on the support wires as compared to total space available (1.24 miles/acre) was calculated as a percentage at late 1993 and late 1994 pruning.

Full cropping (1996–2000)

The number of post-pruning nodes, shoots produced and inflorescences was

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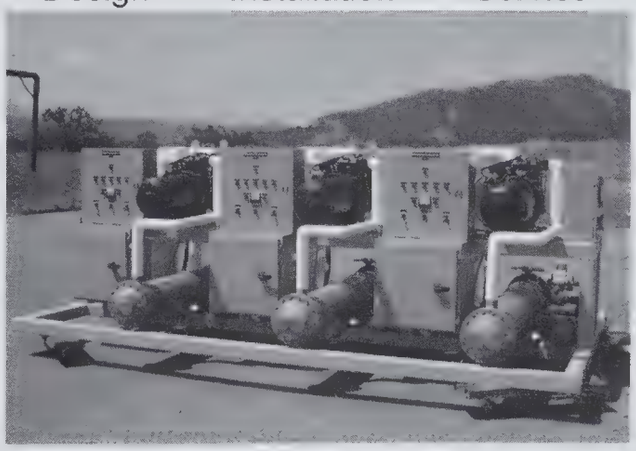

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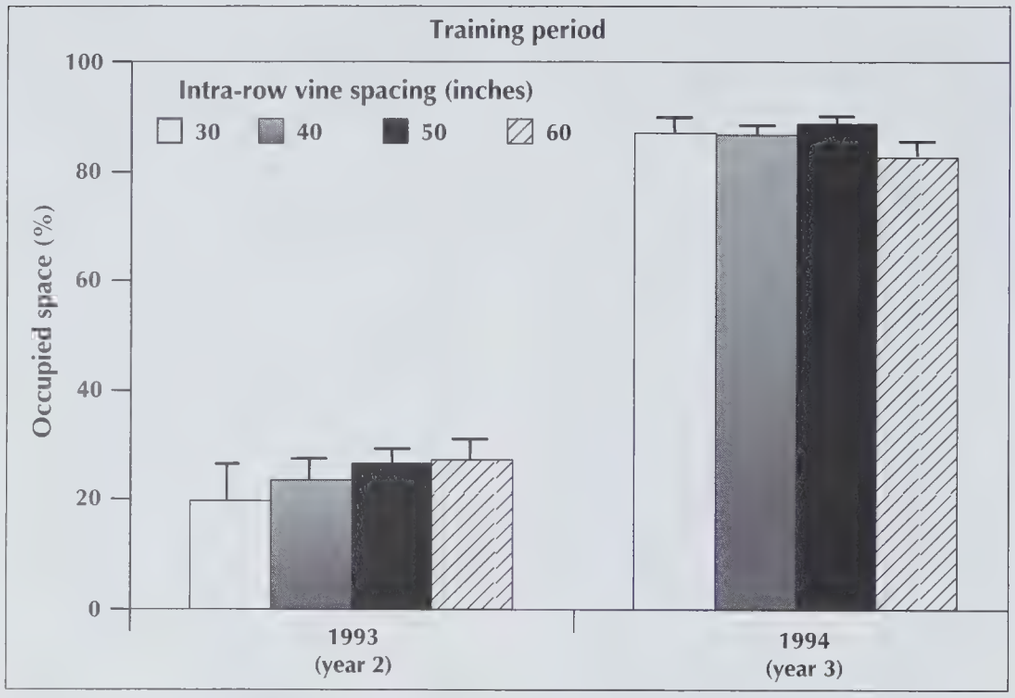
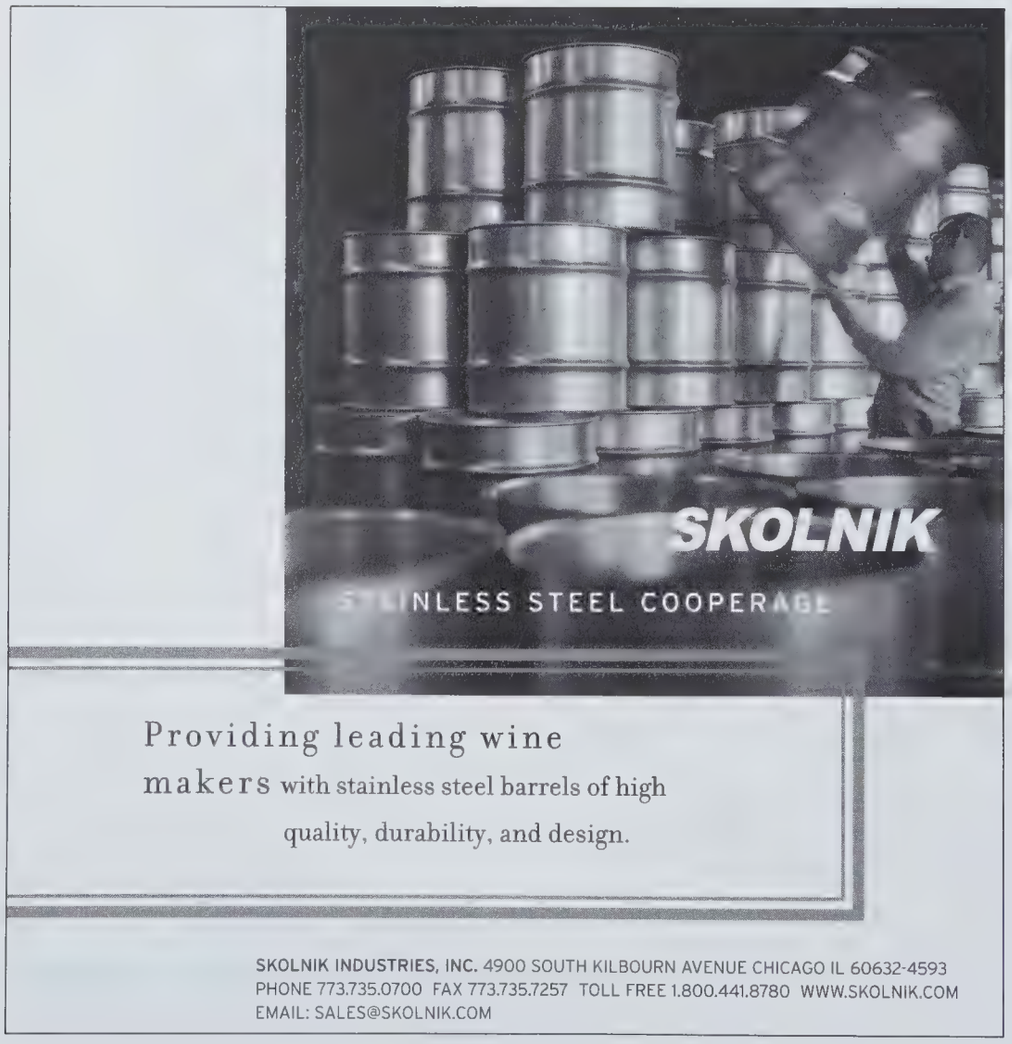


Figure II. Percentage of filled trellis space determined at the end of the second and third growing season for each intra-row vine spacing level. Data pooled over soil management treatments. Vertical bars indicate 2 x standard error.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monitored every spring. Two shoots per vine were measured (at seven to 10-day intervals) to record the number of visible leaves arising from main stem and laterals, up to topping length. Leaf area removed with topping was estimated via the ratio of leaf area to leaf fresh weight. Post-topping vegetative regrowth was followed on the same tagged shoots by recording at intervals the total number of lateral leaves.

At veraison, two shoots per treatment were sampled from extra vines and used to determine mean size of main and lateral leaves with a LI-COR 3000 area meter. After leaf drop, the total number of nodes on all main shoots and laterals were counted on each vine, and total leaf area per vine was estimated by multiplying total leaf (main and lateral) counts by the respective mean leaf area dimensions. The weight of one-year-old pruning wood was also recorded.

Berry samples were collected each year at 10-day intervals from pre-veraison to harvest for assays of soluble solids (Brix), pH, and titratable acidity. The number of clusters and yield per vine were recorded at harvest. Daily maximum and minimum temperatures, relative humidity, and rainfall were recorded throughout the year by an automated station located one-half mile from the vineyard.

Each year, the volumetric soil moisture content was monitored from mid-May to harvest by Time Domain Reflectometry. For each treatment plot in each of two blocks, permanent waveguides were installed in the ground at six-inch (15 cm), 12-inch (30 cm), and 18-inch (45 cm) depths along the vine row and towards the inter-row alley.

Analysis of variance was performed on all the collected data and, when main effects were significant, the means were separated by Student-Newman-Keuls test (SNK, $p<0.05$). Interactions were analyzed by regression for the various soil management practices as a function of intra-row spacing.

Results and discussion

Results will be primarily reported and discussed as main effects of floor management and/or intra-row vine spacing, since scarce significant interactions were found. Soil water moisture data will not be reported since the volumetric soil moisture did not reach the wilting point at 12- and 18-inch depths. Therefore, it was concluded that water was not a limiting factor in

the study. The total rainfall (April 1 to September 30) at the experimental site varied from a minimum of 10 inches (252 mm 1996) to a maximum of 13.5 inches (339 mm 1999).

Training stage (1993–1994)
Occupied space
"soil-management" effect

Subsequent to the 1993 winter pruning (end of second year from planting), the space taken up by the vine skeletons under each soil management practice with respect to the space available on the support wires (values averaged over four levels of intra-row spacing) ranged from a peak of 56% for FT to a low of 0.4% per FS; while the MS, TS, and HS values were respectively 29%, 20%, and 14% (Figure I). These data confirm that full grassing had a notable effect on the vine root-system competition and, hence, on shoot growth.

While maximum vigor was found in the fully tilled terrain, HS also exhibited a good response due to the positive effect of intra-row mulching on the rhizosphere microclimate and, as a result, on shoot growth. The 1993 data also show the occupancy differential of the spacing between the FT (56%) and TS (20%) treatments, the cause of the difference evidently being the fact that FT was under full tilling and TS grassed.

It can thus be assumed that even by Year Two the sward, although limited to the inter-row alley, had already influenced grapevine root development, probably by restricting its lateral spreading. This is also confirmed from data reported by R. Morlat (1981), F. Murisier et al. (1999), and R. Morlat and A. Jacquet (2003), who show that in comparative trials of full tilling and grass swarding (total or partial), the sward cover limits grapevine root development in the inter-row alley.[13,14,15]

The 1994 post-winter pruning data (end of third growing season) indicate that the space occupied by the vine skeletons with respect to that available (Figure I) was fairly similar in four soil management regimes (80% to 90% for FT, TS, MS, and HS) and somewhat still less under full grassing (about 75%).

Occupied space –
"Intra-row spacing" effect

The 1993 post-winter pruning data (Figure II) show that the space occupied by treatments at the various intra-row spacings (values averaged over the five soil management regimes) was relatively similar, varying from 20% (30 inches) to 27% (60 inches). This finding seems surprising given that the vines spaced closer together needed to form shorter cordons to close up the space along the support wires.

Table I. Vegetative growth recorded in Pignoletto vines subjected to different floor management techniques and intra-row vine spacings.

	Nodes/ ft	Shoots/ ft	Budbreak (%)	TLA/m (ft^2/ft)	RLA/m (ft^2/ft)	Pruning weight (lb/ft)
Soil treatment						
FT	5.6	4.3	77.1 a	15.1 a	2.7 a	0.33 a
TS	5.5	4.2	75.7 ab	14.1 ab	2.0 bc	0.29 b
MS	5.7	4.3	75.8 ab	15.0 a	2.4 ab	0.29 b
HS	5.6	4.1	72.9 c	13.7 a	1.7 cd	0.26 bc
FS	5.5	4.0	73.8 bc	13.1 b	1.3 d	0.23 c
Significance	ns	ns	**	*	*	*
Intra-row spacing (cm)						
75 = 30 inches	5.7	4.4	76.4	16.0 a	2.6 a	0.32 a
100 = 40 inches	5.5	4.1	74.2	13.6 b	2.3 b	0.29 a
125 = 50 inches	5.7	4.2	74.9	14.1 b	1.7 c	0.27 b
150 = 60 inches	5.5	4.1	74.7	14.1 b	1.7 c	0.25 b
Significance	ns	ns	ns	**	**	**
Interaction (sig.)	ns	ns	ns	**	*	ns

Data averaged over five years (1996–2000).
* = significant at 5%, ** = significant at 1%, ns = non significant.
Separation within factor and column by SNK test.

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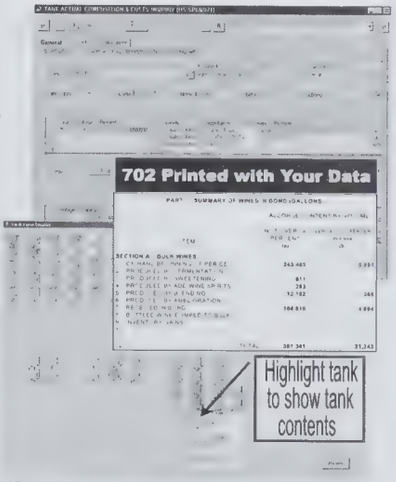

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However, the 1993 vine growth data (expressed as the overall length of all laterals and sub-laterals and the length of the two main laterals) indicate a notable weakening, especially at the 30-inch intra-row spacing, which is symptomatic of competition phenomena. It is thus likely that vines spaced 30 inches apart, to a lesser extent than those at 40 inches apart, exploited the topmost soil layer quickly while still being unable to spread roots into deeper soil layers.

Full cropping (1996–2000)

Vegetative growth — "Soil-management" effect

Given the notably uniform bud load (about 18 nodes per meter), the effect of the various management regimes on shoot and vegetative growth was most pronounced in FT, as shown by both the slightly higher budbreak rate and the greater weight of winter-pruned material (Table I). By contrast, as expected, treatment-FS registered the lowest vigor, most notably 30% less weight in winter-pruned wood with respect to FT.

Of particular note are the data for total leaf area removed (RLA) with mid-June topping: the area removed under full tilling was twice that for full grassing (8.8 ft^2 per vine against 4.4 ft^2). Note, however, that the pruned-wood weight, although underestimated compared to the real value due to the effect of summer removal, indicates a moderate or even low vigor for FT, too. This may be due, at least in part, to the fact that the canes of the double-curtain training system grow downward and hence, constitute an objectively limiting factor to vegetative development.

While the vigor of the MS, HS, and TS regimes was intermediate with respect to the extremes of FT and FS, the treatments of mulching or intra-row tilling provided a slightly bigger vegetative push than did strip herbicide.

Vegetative growth — "Intra-row-spacing" effect

As expected, intra-row spacing effects on growth showed an almost proportional amount of removed leaf area and weight of pruned wood per meter of cordon to diminished spacing. Even the parameter of total leaf area indicated that the vines spaced 30 inches apart scored a significantly higher value (16 ft^2/ft) than those at other spacings.

Here we thus have a confirmation, at least in terms of main effect, of incremental vigor (expressed as per unit of row length) as intra-row spacing narrows.[8] This finding is, to a certain extent, the direct opposite of the response registered in the training stage.

Our data show that vine competition along the row gradually became attenuated, a response that also likely involved deeper growing roots.

Table I shows two significant interactions of management and spacing involving total and removed leaf area. The former (Figure III) is important in practical terms. The curves indicate a reduced total leaf area per meter as intra-row spacing increases for the two weakest management regimes (FS and

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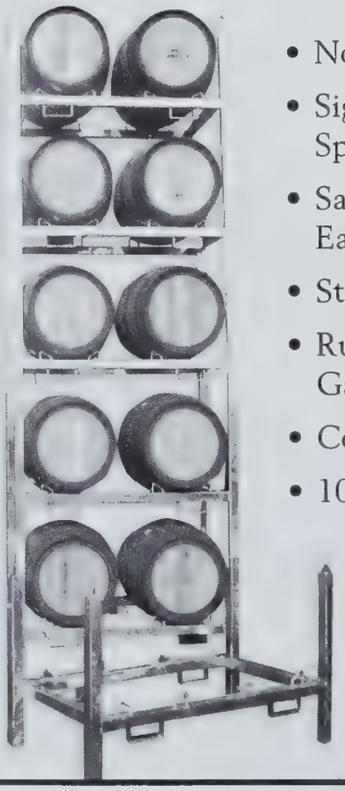

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HS) and, in contrast, an essentially unchanged pattern on other regimes. This means that soil management regimes, which already are "naturally" inclined to induce lower vegetative growth accentuate phenomena of vine weakness in proportion to progressive intra-row vine spacing.

Yield and quality
"Soil-management" effect

Here the management effects on the main yield components (Table II) show a performance spread of 2.6 tons/acre (TPA) between the highest-yielding (FT = 9.3 TPA) and lowest-yielding (FS = 6.7 TPA) treatments. Once again, the other three treatments registered intermediate scores, although TS and MS had notably higher yield than HS.

Yield components that account for these differences are average cluster weight (six ounces in FT against five ounces in FS), and a shoot fertility of 1.65 (clusters per shoot) in FT and 1.54 in FS. These data suggest that the difference in average cluster weight is probably not so much imputable to single-berry weight variations as to berry number per cluster.

Table II. Yield and components of yield recorded in Pignoletto vines subjected to different floor management techniques and intra-row vine spacings.

	Yield/m (lb/ft)	Yield/ha (t/acre)	Clusters/ shoot	Clusters/ ft	Cluster weight (ounces)	Berry weight (ounces)
Soil treatment						
FT	3.1 a	9.3	1.65 a	8.2 a	6.03 a	0.072
TS	2.7 b	8.3	1.58 ab	7.4 b	5.89 a	0.073
MS	2.7 b	8.3	1.58 ab	7.6 b	5.78 a	0.074
HS	2.4 c	7.1	1.51 b	7.2 bc	5.15 b	0.071
FS	2.2 c	6.7	1.54 b	7.0 c	5.08 b	0.070
Significance	**	–	*	**	**	ns
Intra-row spacing (cm)						
75 = 30 inches	2.7	8.1	1.53	7.6	5.61	0.071
100 = 40 inches	2.6	7.9	1.57	7.4	5.61	0.073
125 = 50 inches	2.7	8.1	1.58	7.5	5.64	0.073
150 = 60 inches	2.6	7.7	1.60	7.4	5.50	0.071
Significance	ns	ns	ns	ns	ns	ns
Interaction (sig.)	ns	ns	ns	ns	ns	*

Data averaged over five years (1996–2000).
* = significant at 5%, ** = significant at 1%, ns = non significant.
Separation within factor and column by SNK test.

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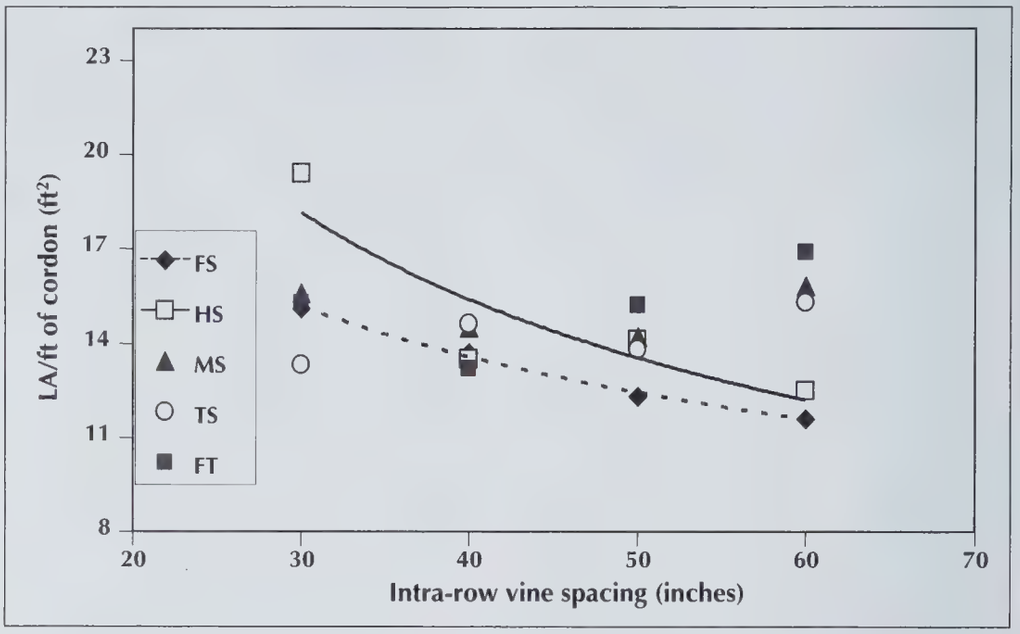

Figure III. Variation of leaf area per m of cordon (estimated at veraison) for each soil management treatment at varying intra-row vine spacing. Regressions were significant for HS: ($y = 44.8 - 1.19x + 0.011x^2$; $R^2 = 0.87$) and FS ($y = 22.2 - 0.29x + 0.019x^2$; $R^2 = 0.99$).

There is thus reason to think that the early date at which limited vigor appeared in the weaker regimes every year with respect to the more vigorous

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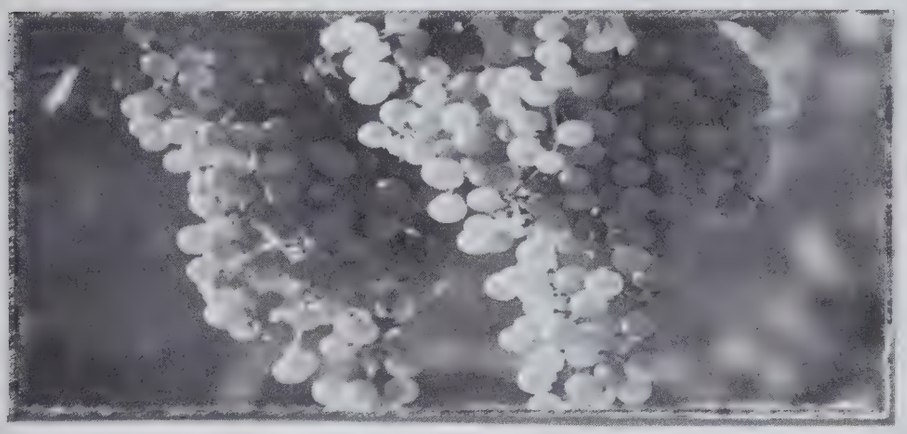
Table III. Must composition and parameters of source-sink balance recorded in Pignoletto vines subjected to different floor management techniques and intra-row vine spacings.

	Soluble solids (°Brix)	pH	TA (g/L)	Total sugar (ounces/ft)	Yield/PW (lb/lb)	TLA/yield (ft^2/lb)
Soil treatment						
FT	20.5 b	3.39	6.8 a	10.1 a	10.1	5.3 b
TS	22.1 a	3.43	6.2 c	9.6 a	10.1	5.6 ab
MS	21.0 b	3.42	6.5 b	9.1 ab	9.7	6.4 ab
HS	22.2 a	3.44	6.1 c	8.3 b	9.6	7.4 a
FS	22.3 a	3.44	6.0 c	7.9 b	10.4	7.0 ab
Significance	**	ns	**	**	ns	**
Intra-row spacing (cm)						
75 = 30 inches	21.5 b	3.44	6.3	9.2	8.9 c	7.3 a
100 = 40 inches	22.0 a	3.43	6.2	9.1	9.6 bc	6.2 b
125 = 50 inches	21.4 b	3.41	6.4	9.1	10.5 ab	5.8 b
150 = 60 inches	21.5 b	3.41	6.3	8.6	10.9 a	6.3 b
Significance	*	ns	ns	ns	**	*
Interaction (sig.)	ns	ns	ns	ns	ns	ns

Data averaged over five years (1996–2000).
* = significant at 5%, ** = significant at 1%, ns = non significant.
Separation within factor and column by SNK test.

ones may have adversely affected flower-bud differentiation, whether expressed as number of flowers or fruit-set rate.



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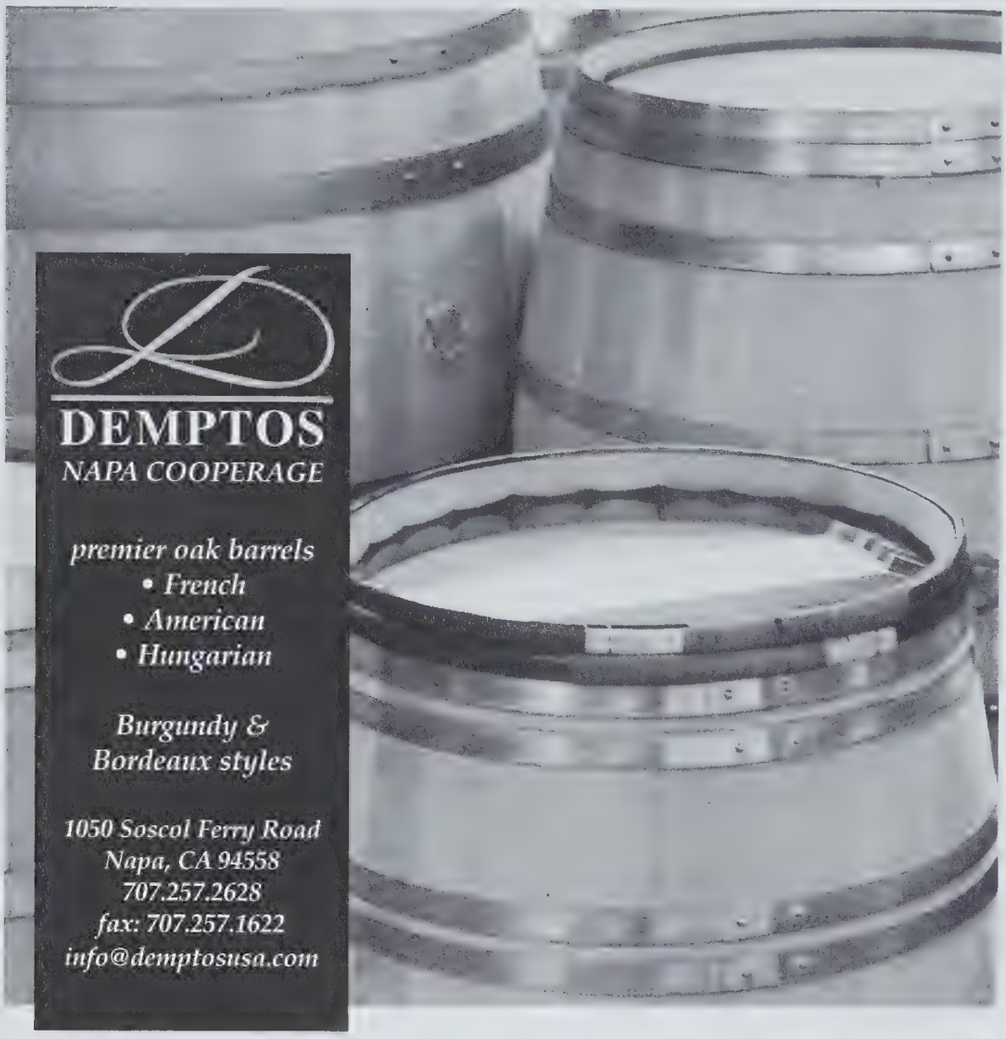

Grape ripening (Table III) substantially reflected expected trends on the basis of yield levels. Grapes from the full-tillage regime registered a lower sugar and a higher titratable acidity level than those from FS and HS. TS and MS again recorded intermediate values, although the latter's grapes showed a lower soluble solids value than those from TS, HS, and FS.

The two indices, yield/pruned-wood weight and total leaf area/yield, in Table III help explain the ripening data. In effect, while the former (lb/lb) is notably similar among treatments and, hence, does little to pinpoint and explain the objective differences in maturity, its absolute value (approaching 10) signals a shift towards yield over vegetative development.

More informative is the latter index (ft2/lb), which, at the very least, tends to show that the sugar increase in FS (+1.8° Brix with respect to FT) also matches a greater leaf area per unit of yield (7 ft^2/lb against 5.3 ft^2/lb). Nor does this rule out that, in the weakest treatments (FS and HS), ripening was promoted by reduced competition with vegetative growth and a diminished canopy density.

Thus, the relationship of "functional" and "active" leaf area to yield may have been even more favorable with respect to what occurred, for example, in FT. Note, too, that HS and FS registered higher leaf area-to-yield values than did the full-tillage treatment, indicating that the sward induced a decrease in yield which was more than proportional to that in vigor.

Yield and quality
"Intra-row-spacing" effect

Unlike the soil-management factor, intra-row spacing had no significant effect on either overall yield (7.7 to 8.1 TPA range) or its main components (Table III). This finding is, in any case, coherent with the notably similar bud break rates recorded at all vine spacings (Table I).

In line with our yield data, intra-row spacing did not result in large variations in grape quality, although a higher grape sugar concentration was found for vines 40 inches apart than at other spacings. The yield-to-pruned-wood weight ratio clearly showed a progressive shift towards the productive function over the vegetative as intra-row spacing increased.

The larger leaf area per unit of yield recorded in the 30 inch spacing was not

paralleled by any grape quality improvement, once again suggesting the need to distinguish between "total" and "functional" leaf area.

Conclusions

The overall five-year data allow for several observations:

- The occupied space and, in the end, the rapid initial cropping were adversely affected by grass sward sown at the end of vineyard Year One. While the effect was most evident in the full-sward treatment, it remained, to varying extent, even in the treatments limited to inter-row grassing.

However, while it would thus appear preferable to postpone seeding a sward until the end of the second growing year, the difference in occupied space between the grassed and fully tilled treatments practically disappeared by the end of Year Three. Such indirect advantages as alley access to heavy equipment, erosion and run-off control, moisture-retention capacity, and reduced soil compaction that are achievable with early swarding, such as at the end of Year One, should be taken into account.

- The data for vegetative response to tipping, designed to establish two cordons of the GDC trellis during the training period, indicate the occurrence of root competition phenomena, at intra-row spacing under 40 inches. Indeed, 30-inch intra-row spacing appeared economically inconvenient, not only because of the higher number of vines (and supports) required, but also because it did not lead to any significant earlier initial vine cropping.
- The "soil-management" factor proved to be significant for vigor, yield, and grape quality. By contrast, vine agronomic performance did not vary much as a function of intra-row spacing. Thus, given our trial conditions, reducing intra-row spacing was not decisive either for yield level or grape quality.
- The most relevant finding related to the effects of the soil-management regimes tested is that the variation led to a gradient shift in vigor, yield and, above all, ripening dynamics. The data show that soil-management regimes have historically been widely undervalued as a tool in regulating a vineyard's vegetative growth-yield equilibrium.

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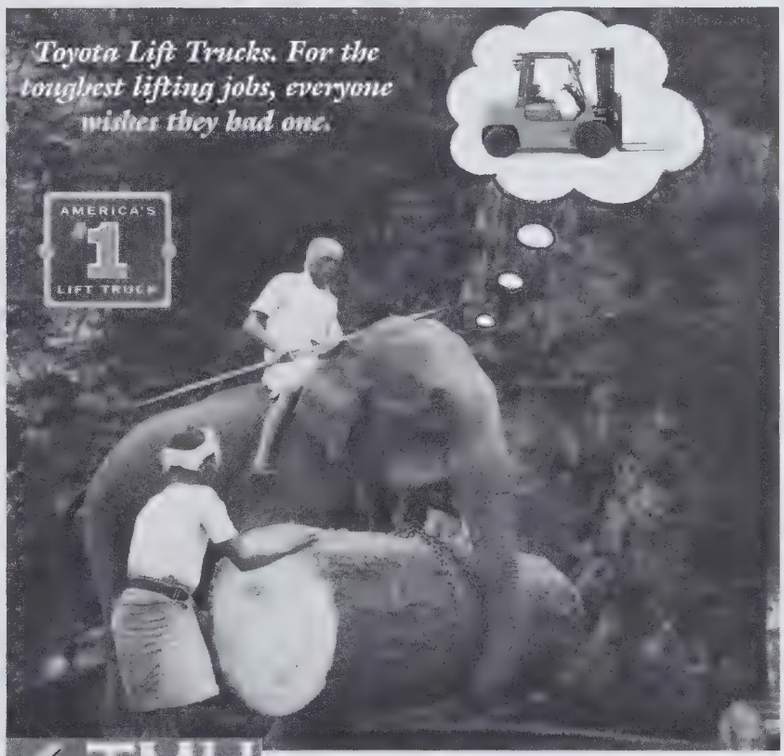

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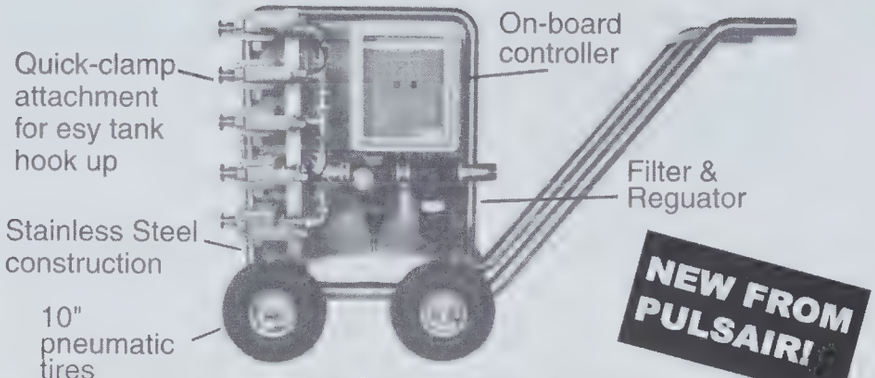

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• In terms of quality alone, the vines under the tested management regimes reached a more or less advanced ripening, as are compatible with appropriate winemaking profiles. In other words, if the ripening degree achieved by FS and HS (22.3° and 22.2° Brix with 6.0 and 6.1 g/L titratable acidity, respectively) is, for example, adequate for a Pignoletto wine of notable body and good aromatic complexity, the degree achieved under full tilling (20.5° Brix and 6.8 g/L titratable acidity) is well-suited to a lighter and easy drinking Pignoletto.

• While the response to the various intra-row spacings tended to be uniform, the overall data for space occupied (especially disadvantageous at 30 inches throughout training), for sugar levels and for the vegetative growth-yield equilibrium (the vines at 50 and 60 inches surpassing the threshold of 10 lbs grapes per lb pruned wood) indicate the one-meter spacing as preferable for GDC-trained vines.

• Few interactions between soil management and intra-row spacing were recorded. This response depended mostly on the moderate overall effects induced by variations of the latter factor. However, the significant interaction between soil management and intra-row spacing found for total leaf area per vine suggests that it would be advisable to observe the spacing limits indicated here (not less than 40 inches, or two 40-inch cordons per vine), especially when planning for a similar GDC-trained vineyard calls for full swarding or inter-row grassing with under-row chemical weeding. ■

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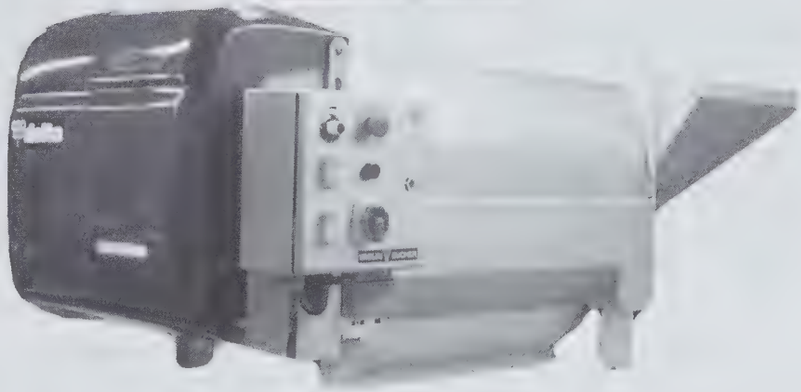

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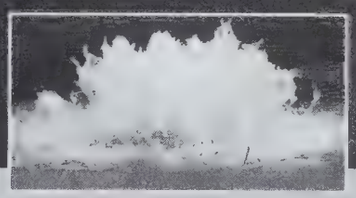

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How to win MEDIA coverage

BY Tom Wark, Wark Communications

"Why weren't we included in the story?" "Why does that winery always get coverage, but we don't?"

"How could they write about our appellation and not even talk to us?"

If you've ever said or thought this, keep reading. You are about to learn that, when it comes to getting positive coverage from the wine media, it's not so much the squeaky wheel that gets the grease. Rather, it's the thoughtful vintner who gets the coverage.

If there is one important lesson that has been impressed upon me over and over in my 15 years of wine public relations, it's that press coverage comes from giving writers what they want — not what you want them to have.

Consider the titles of the two following press releases and ask yourself: Which is more likely to gain the attention of a writer or editor?

A. XYZ Winery Releases 10th Vintage of "Joe's Vineyard" Cabernet Sauvignon.

B. XYZ Winery Bets Single Vineyard Wines Will Define California Wine Quality.

If you correctly identified press release B, then why have you been sending out press release A all these years? The answer is that it's often very difficult for a winery owner or marketing staff to look beyond their own vineyard and wines when taking the time to send information to the press.

The 10th Anniversary Vintage of Joe's Vineyard Cabernet is a big deal ... to the vintner. But to the writer (and his readers), the issue of single vineyard wines versus appellation wines is much more compelling.

But here's the thing: Both press releases are announcing the 10th Anniversary of Joe's Vineyard Cabernet. It's just that press release B gives a writer something to think about, some context for the 10th "Joe's Vineyard" Cabernet, while press release A offers little beyond a boring fact.

In May 2004, Wark Communications conducted the American Wine Writer Survey. In this survey of 411 wine writers, 60% of the 115 respondents said they find press releases from wineries to be only "somewhat" useful. Fully 36% said they are "rarely" useful. A mere 4% said press releases are "very" useful.

Lesson? We are boring writers to death with the information we send them.

From the same survey, 75% of respondents said "new products" are most often the subject of press releases they receive. Translation: They get press release A about XYZ Winery's "Joe's Vineyard" Cabernet. What's even worse, 38% of writers responding to the survey said they most often get press releases announcing "Awards or Medals" received by a winery.

When was the last time you saw any wine publication cover the fact that the "Joe's Vineyard" Cabernet received a Gold Medal at the Southern Hemisphere International Wine Challenge?

"But," you may be thinking, "doesn't the cumulative effect of press releases about my wine winning awards build an impression of quality over the long haul, even though the press releases gather no other reward?" You might make that case, however, this survey demonstrates that such releases are probably detrimental to your intentions. Eventually, writers will disregard releases from your winery based on the uselessness of previous releases.

Perhaps the most telling piece of information revealed by the survey is that only11% of the responding writers said that "trends" are most often at the heart of the press releases they receive.

Think about the major wine publications and wine columns. They predominantly cover trends, but publications and wine writers are not receiving much information about trends from winery marketing staff. It's no wonder only four out of 115 writers think press releases are "very" useful.

Remember the three questions at the beginning of this article? The answer to all of them is the same: Wine writers aren't obtaining any news they can use from your winery's press releases.

What wine writers want

"Well then," you ask, "How can I find out what kind of information the writer wants?" Answer this and you will be on your way to propelling not just your winery's name, but also your core marketing message into print. In the end, this is what you are looking for from your public relations efforts.

There is a way so simple it seems almost devious to learn what writers and magazine editors want: Read! Read (or be sure that someone at your winery reads) the columns and articles written by wine writers you hope will cover your winery. Read the publications that could benefit your winery.

Read with an eye to finding trends that relate to your winery products.

Walk into any PR professional's office and you will likely see many issues of wine magazines, general interest publications, and clips of newspapers. All that paper isn't there just so the PR staff can see whether their clients made it into print. It's there because all PR professionals want to know what's being written about and who is writing what.

If you are asking yourself, "Is this what PR people do all day? Read?" The answer is "Yes!" In part, they do.

Someone at your winery can easily monitor the wine press by subscribing to 10 magazines or so and using the Internet. What you'll find, as you begin to read, are patterns. Certain writers tend to cover certain areas of the wine world. Some write about trends. Others explore technical aspects of winemaking and vineyards. Others write up tastings according to varietals or regions. The point is to understand what writers want, so you can present your winery's information in the way that will be most useful to them.

In the survey, wine writers were asked, "What topic do you prefer to write about?" 42% responded: "Personalities." 27% prefer to write about terroir, and 26% said winemaking or wine reviewing;" 13% cited the "business" of wine or events. Use this insight, along with the perspective you gain from your reading, as you plan your next press release and who will receive it.

For example, a press release on winemaking, *terroir,* or business practices and philosophies could speak to what your winery has been doing in the context of what has been done — in other words, in the context of industry trends. Consider developing and delivering a press release that explains how your viticultural or winemaking practices take advantage of new technologies or simply take a position on an issue.

Currently the issue of highly extracted wines resulting from longer hang time and severe manipulation is being debated in the media and industry. Do you have wines that buck that trend or wines that embrace this method of winemaking? Talk about them.

Finally, even though a whopping 42% of wine writers say they want to write about personalities, it is rare, or should be rare, to send out a personality profile as a press release unless that profile puts the personality into the context of a management or personnel trend.

For example: "Roshambo President Breaks the Mold of Winery Owners by Bringing Younger Consumers to Wine." This would be a way to "profile" someone in a useful way.

Try developing and delivering a press release that positions your wine-

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maker or winery owner or marketing executive as an innovator or change maker. This means going well beyond the typical release announcing a new hire.

Use publications' editorial calendars

There are other ways of understanding what wine magazines want. Each year, magazines publish editorial calendars in which the broad strokes of their topics for the next 12 months are outlined. You'll be able to tell when they will be reporting on Pinot Noir or a new tank technology or packaging trends. Armed with this information, you can contact magazine editors with a letter, email, or phone call and let them know how your winery relates to these upcoming topics.

A PR pro at a winery or agency spends a good deal of time working the editorial calendars, but it's just as important to contact writers regularly, outside the context of their editorial calendar. How?

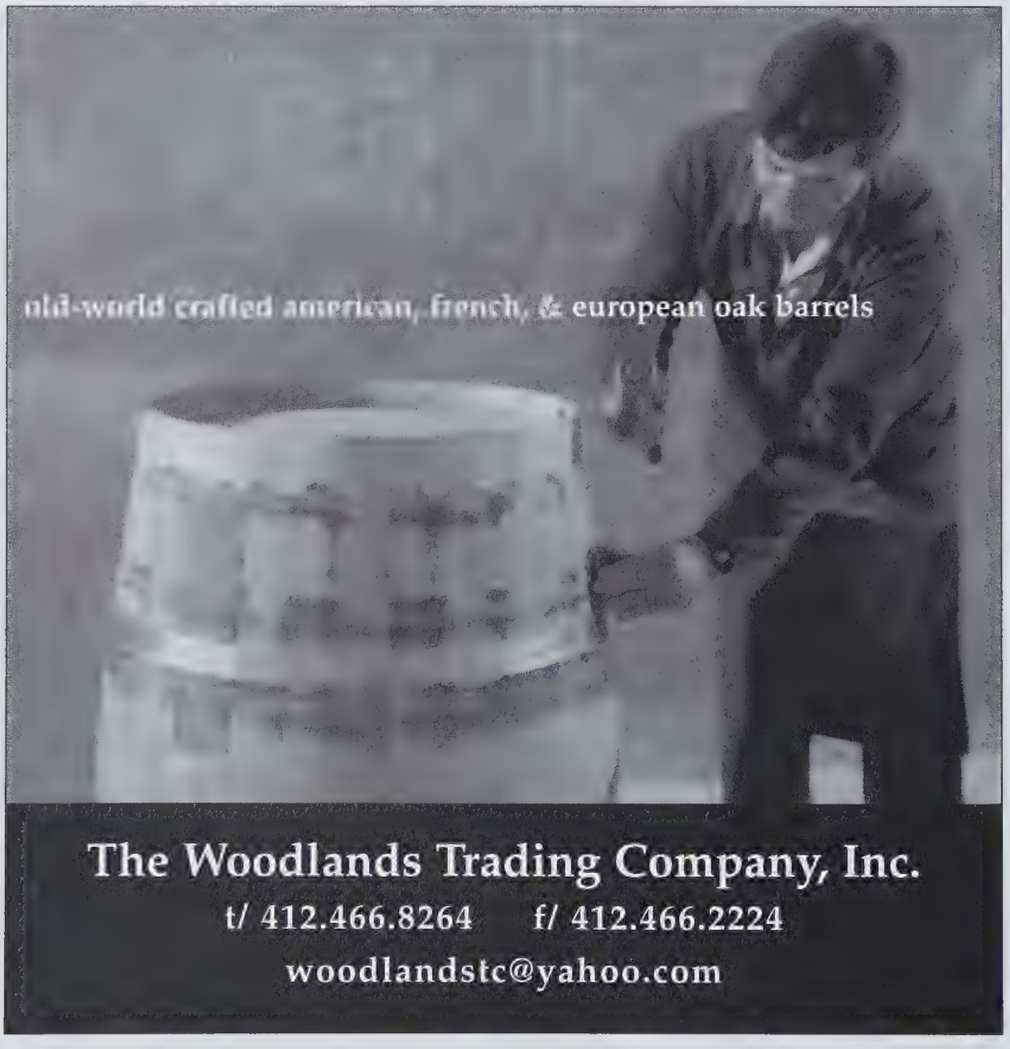
The answer: individually. If you are reading the wine press regularly, you should have a good idea of what topics and issues appeal to a number of different writers. Perhaps you've noticed that Dan Berger tends to write about winemaking trends as well as value wines. Or you've noticed that Eleanor and Ray Heald often do varietal reviews in *PWV*.

Use this information to give writers what they want: a compelling story idea that, (incidentally) reflects your winery's core marketing message. The effort may not result in a story immediately, but it may plant a seed for a later date.

If you are going to send out a press release, make sure it has news that writers can use. Sure, it's O.K., and even important, to announce a new winemaker or national sales director. But these kinds of press releases rarely generate more than two or three inches in an "industry news" section.

In order to generate more extensive coverage, your press releases should deliver ideas. Be an informed vintner and use a press release to take a stand on an issue of the day. Use a press release to demonstrate how your winery fits into a trend. Whatever you do, don't bore the wine writers! Follow that main guideline, and you'll begin to garner the positive press coverage you're always looking for. ■

Tom Wark is owner of Wark Communications, Sonoma, CA. The American Wine Writer Survey is available to download from www.warkcommunications.com/pages/downloads.html.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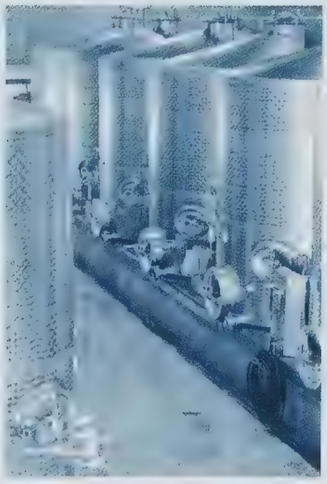

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PIONEERING WALLA WALLA WINERY

Expansion at Leonetti Cellars

BY Laurence Ferar
Laurence Ferar & Associates, Inc.,
Portland, OR

Gary Figgins pioneered winemaking at Leonetti Cellars in the Walla Walla, WA, area in 1977, along with Rick Small of Woodward Canyon Winery. Today, more than 60 commercial wineries call Walla Walla home, and Gary's son Chris shares the winemaking and vineyard duties at Leonetti, which was named for Gary's home-winemaking maternal grandparents.

I first met Gary and Chris when they came to tour the winery that my firm had designed for Adelsheim Vineyard in Newberg, OR. They were preparing to enlarge their winery and had enlisted our help. From the outset, Gary made it clear that he "already had a showcase." He wanted a simple, functional facility that would complement his cramped but lovingly crafted stone winery.

Gary had a basic floor plan in mind. The concept included a large underground cellar that would be connected to the existing cellar by means of a tunnel; a fermentation room large enough for all of the tanks; case storage to accommodate an entire vintage; a bottling line; and a laboratory with plentiful counter space.

When Gary's verbal description was translated into scale drawings, one point immediately became apparent. In contrast to the existing facility, the new building seemed huge. Careful design consideration was required to bring the scale down so it didn't overpower the companion building.

We focused on breaking up the overall form by articulating the different functions within. The ridgeline of the fermentation room was shifted so that it ran perpendicular to the case goods warehouse. This allowed extension of the roof to cover the exterior crush pad.

The entry, lab, and stairways were conceived as "sheds" attached to the new main building. Light monitors were used to bring in natural light and to break up the large expanse of roof. Earth was bermed up against the side walls to reduce the apparent size of the building while at the same time providing temperature modulation. Finally, wooden beam ends, soffits, and an entry trellis were used to provide scale and to visually tie the new building in with the existing building.

Cost concerns

Gary and Chris were favorably impressed with the pre-cast concrete bridge system used for barrel cellars at Adelsheim Vineyards in Newberg, OR (*PWV* May–June 1998). Once the basic layout of the Leonetti cellar was established, costs were requested from the same supplier, but we quickly ran into a major roadblock. The closest pre-cast plant licensed to produce the patented system was in Portland, OR. Shipping 30 18-ton units for five hours by truck across Washington state was going to be cost-prohibitive.

Alan Ketelsen, the general contractor, introduced us to Wayne Narum of Narum Concrete Construction in Walla Walla. Together, we made another visit to Adelsheim Vineyards. Wayne and brother Rick had learned the trade from their father. With family experience that ranges from dams on the Snake River to cooling towers at the Hanford nuclear facility, they were not the least bit intimidated by the curved formwork that would be required to build arched wine cellars.

Working closely with Narum and structural engineer Mike Harrison, we

To create the concrete arches for the barrel cellars, three forms were bolted together as a unit and roll on tracks. After each section is poured and cured, the form is lowered and moved forward. Construction proceeded at a rate of one 10-foot section per week.

were able to provide a design that was both cost-effective and specifically tailored to Figgins's needs. Narum even mocked up a full-size (15 x 60 ft.) cross-section of the cellar in plastic sheeting and taped it to the side of a neighbor's warehouse, so Gary and Chris could get a realistic feel for the space.

The unique forming system consists of three parallel vault-shaped steel forms mounted on a track. The two outside vaults are 20 feet wide, while the center span is 15 feet wide. They were poured in 10-foot lengths, each with an integral headwall that serves as a beam to support the decking for the floor above. Each arched form was equipped with two vibrators to make sure the concrete was well consolidated.

After each section was poured and allowed to cure, the form was lowered, moved forward on the track, and raised into position to form the next 10-foot long bay. The complete cycle — positioning the form, installing the reinforcing, pouring the concrete, and repositioning the form — took about one week.

Chris Figgins shovels out pomace for pressing. Opening the two fermentation room doors provides plenty of cross ventilation for CO_2 evacuation.

This cast-in-place system proved so successful that we have subsequently used it, with some adaptation, on two other projects. At neighboring Pepper Bridge Winery in Walla Walla, the same forms were modified by bolting on extensions to increase the span. At Alloro Winery, currently under construction near Portland, two 20-foot sections are used to create a scaled-down cellar. The Walla Walla Community College teaching winery will also use the same system.

Stacking the case goods and fermentation rooms directly over the cellar avoided many of the drainage and waterproofing issues and related expenses faced on other projects where cellars are simply covered with soil.

Like most state codes, the Washington-state building code requires fire sprinklers in "every story or basement of all buildings when the floor area exceeds 1,500 square feet." Working with the local building official, we were able to negotiate use of an early warning smoke and fire detection system combined with a protected fire stair in lieu of required fire sprinklers.

Completed cellar provides ample room for working barrels. Illumination level is adjustable from low "mood" lighting to more intense work light. Smooth steel formwork provides a polished marble-like finish. A clear sealer was applied over raw concrete to provide stain resistance and facilitate cleaning.

Building in flexibility

Previous project experience made us aware of the continually evolving nature of winemaking technology. We sought to provide a measure of flexibility by designing an accessible horizontal utility chase running the entire length of the building, between the arched cellar ceiling and the floor level above. An auto mechanic's

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NAPA VALLEY WINEGRAPES

Exploring geology's effect on "terroir"

BY Jonathan Swinchatt
EarthVision, Inc.

Until recently, geological analysis has not been considered important to the task of growing high-quality winegrapes. Historically, grapegrowing has been within the domain of agriculture, where soil analysis provides all the critical information. Now, however, with increasing focus on all aspects of the vineyard, winegrowers and winemakers are seeking to learn everything they can about the ground in which grapevines grow.

With increased focus on *terroir* and single vineyard wines, winegrowers, winemakers, and wine enthusiasts alike are seeking more definitive information on the provenance — the so-called "deep history" — of grapes and the wine that comes from them.

Since 1990, when my colleague David Howell and I produced a video on earth and wine in the Napa Valley, we have pursued the notion that geology is the vehicle that would provide this additional information. Recent studies undertaken for a report ("The Foundations of Wine in the Napa Valley: Geology, Landscape, and Climate") and a book *(The Winemaker's Dance: Exploring Terroir in the Napa Valley)* substantiate this view.

We have demonstrated how geologic factors act as important controls on some of the environmental conditions most important to growing high-quality grapes — particularly drainage and the ways in which water is made accessible to vines. Since completing those initial projects, EarthVision, Inc. has conducted detailed studies of specific vineyards.

Using a geological viewpoint, we have shown that substrate variation takes place on a very local scale, often within a few feet or tens of feet. This variation reflects primarily the origin of the material as controlled by geologic processes.

Geologists see vineyard substrate from a different perspective than do soil scientists. Soils actually form through the transformation of pre-existing geologic materials by physical, chemical, and biological action.

Pre-existing materials include various kinds of bedrock and the host of granular by-products (sediments) derived from them. Soil science is primarily descriptive while geology is genetic — it is concerned with processes that effectively record the origin and relative age of vineyard substrate and the transformative events that have influenced it.

Geology embodies a vital predictive capability. Knowing the characteristics of a geologic unit and understanding what processes these suggest, one can infer how the unit formed and, furthermore, one can predict how the deposit will vary across its spatial extent. This geologic perspective provides a conceptual model, based in science, that can serve as a powerful organizing context for integrating a variety of information, including soil analysis, Normalized Difference Vegetation Index (NDVI), and the personal experience of winegrowers, winemakers, and other vineyard personnel.

For wine enthusiasts, and connoisseurs, geology is a window into the foundations of wine and the deep history of any piece of land, conveying a unique story that sets one property apart from another. Viticulturalists, vineyard man-

Figure I. Map of the distribution of Earth Process Units (EPUs) in the Napa Valley AVA.

Figure II. Map of a portion of Fay Vineyard, Stag's Leap Wine Cellars. Yellow dashes outline a lobe of the SLWC fan that was formed by a single mudflow. Blue dashes mark the axis of the flow. The area outlined in black is defined on geological criteria but coincides with the block #8 "sweetspot" known also as the "hershey kiss," defined by taste.

agers, and winemakers may move from property to property, but the land stays largely the same, always the most stable factor in the complex world of *terroir*.

Origin of vineyard substrate

The first step in understanding the relationship between geologic factors and winegrowing in any region is to establish the regional geologic context. The above-mentioned two publications provide this regional overview for Napa Valley.

The140 million years of history and the origin of the valley are detailed in terms of individual geologic elements — the bedrock components that are the foundation of the region. These include the sandstones and shales of the Great Valley sequence, the ocean floor sediments and chunks of ocean crust that make up the Franciscan Formation, and the diverse types of volcanic rock that comprise the Sonoma Volcanics (in the two publications, we have used the name "Napa volcanics").

These rock units are the parent materials for the loose sediments in which grapevines grow and upon which soils form. The two publications also provide a geologic perspective on the origin and character of these sediments — the stuff that most people categorize simply as soil, but from which a geologist deciphers the processes and events that have most recently affected that land.

Sediments that cover most of the surface of the Napa Valley American Viticultural Area (AVA) are all derived from the decay of bedrock through physical, chemical, and biological processes. Some of this sediment stays in place or moves only a short distance, but the bulk of it is transported to new settings by gravity, water, and wind. Ice (glaciers) can also act as a transporting agent, though not in Napa Valley.

Introducing EPUs

The character of the deposits that result from these processes is so important in determining grape quality and character that we have created a new organizing concept: the Earth Process Unit (EPU). In Napa Valley, we have identified and mapped the distribution of three EPUs (Figure I).

The geologic processes that characterize each of these environments impart particular characteristics to the deposits that result. The texture, structure, and internal architecture of each of these EPUs have unique attributes that set them apart from the others.

Residual EPUs are made up of sediments that have accumulated in place or moved only a short distance. They characterize most of the upland topography of the Napa Valley AVA, in the mountains and on the slopes. There, dilute organic acids act to slowly decay the outer surface of the bedrock and the cover of overlying granular material.

Residual sediments are, in many places, only a few inches thick, though they range up to several feet. Often the contact between bedrock and the sediment above is a transition from solid rock, through progressively more decayed material, into the soft and loose surface sediments that have mixed with organic debris in the top few inches. Drainage is good to excessive. Roots often penetrate into cracks and crevices in the bedrock.

Alluvial EPUs — the alluvial fans that form at the edges of the valley — are complex environments in which lenses (small accumulations of limited vertical and lateral dimension) and layers of boulders, gravel, sand, silt, and clay are arranged in intricate vertical and lateral formations. The run-off of rainwater moves loose sediment from the hills, gathering it into gullies, creeks, and streams. The fast-moving water slows abruptly when it hits the flat valley floor, and sediments are deposited in patterns that mimic river-mouth deltas.

Coarse sediments are commonly dropped at the edge of the valley, though stream channels carry coarse debris well onto the fan. Low swales

filled with silt and clay lie between these channels. During floods, streams break through their banks, delivering coarse debris to the swales, where it forms discontinuous lenses and layers within the finer sediments. The result is a complicated architecture of lenses of sand and gravel, interleaved with layers of finer-grained materials.

Fluvial EPUs consist of sediments that have been moved, in this case, by the Napa River and have come to rest on or in its flood plain. Architecturally, fluvial sediments have an internal structure similar in complexity to those of alluvial fans, with coarse channel material interfingering with finer overbank sediments deposited during floods, although the finer sediments dominate these deposits. These are the thickest, finest, and most agriculturally-vigorous of Napa vineyard substrates.

Assuming a climate suitable for growing high-quality winegrapes, drainage — and how water is made accessible to grapevines — appears to be of primary importance in producing premium wine.

Our studies indicate that geologic factors and processes control these substrate attributes through their influence on the texture, structure, and architecture of sedimentary deposits. As a result, understanding the geologic character of the EPUs and, more importantly, establishing the geologic conditions that have affected specific vineyards, is vital if one is to fully understand the *terroir*.

In general terms, residual deposits are thin and well-drained. They occur mainly in the hills, where bedrock is near the surface. Their chemical composition will reflect that of the bedrock that lies beneath. This has particular significance for vineyards planted on the Franciscan Formation, which tends to be high in magnesium, low in potassium, and contains pods of serpentinite. Serpentinite is a rock composed mainly of the mineral serpentine, which is high in boron and nickel — both toxic to grapevines.

Alluvial fan deposits tend to be coarse and better-drained in their upper reaches and along longitudinal channels, while the material is finer-grained and less well-drained toward their outer boundaries. Detailed examination of vineyard blocks throughout the large To Kalon Vineyard on the Oakville fan, however, has revealed important local variation to this generalized model.

One of the most interesting aspects of this work has been how the arrangement of sediment layers affects the water table. Ordinarily, the water table is relatively consistent over considerable areas.

On the Oakville fan, however, we have seen as much as a three-foot difference in depth to the water table over a lateral distance of a few hundred feet. This appears to reflect the interplay of coarse deposits that channel ground water with fine sediments that impede its flow and cause it to pond, forming what are known as "perched" water tables.

Commonly fed by a single stream, the mineral and chemical composition of an alluvial fan reflects the bedrock composition of the stream watershed, which can be superimposed on a geologic map to establish the character of the parent material.

Fluvial deposits are generally dominated by silts and clays. They occur on the river flood plain, which laps up onto the outer edges of the alluvial fans, making the distinction between alluvial and fluvial EPUs difficult.

Sediments of river flood plains are rich with organic material, and their clay minerals tend to hold water, making them agriculturally vigorous. Draining the entire valley as they do, the sediments at any point along the Napa River are a mixture of all the bedrock types lying within the large river watershed above that point.

Vineyard-specific studies

Over the past two years, EarthVision, Inc. has been conducting detailed geologic studies of specific vineyards, creat-

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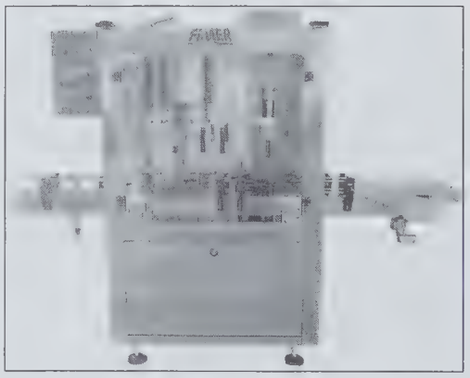

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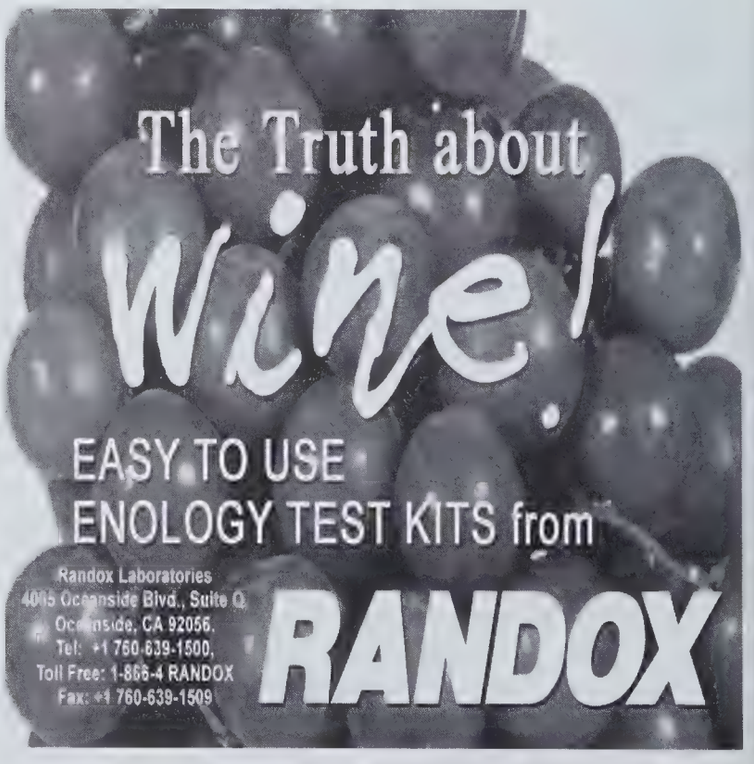

ing "geologic portraits." These studies are based on surface mapping of the vineyard combined with examination and description of backhoe pits penetrating to depths of up to 10 feet.

On open, undeveloped land, we have examined up to four or five pits per acre. In established vineyards, pits are located around the edges of vineyard blocks in a pattern that will most effectively reveal the internal architecture of the vineyard substrate.

By combining photos of the pits with detailed descriptions of the substrate, maps of surface variation, maps of the regional geology, and a thorough account of the origin and depositional history of the substrate, our reports provide a rich visual and conceptual picture of the vineyard. This picture provides a context within which to organize other data including soil analysis, NDVI, and personal experience of winegrowers, winemakers, and other vineyard personnel, all of which adds up to a fresh and integrated view of this information.

The importance of this approach has been shown in a number of ways. Our reports have:

- Illuminated the distribution of groundwater and aided in planning drainage systems;
- Helped in the understanding of substrate variation in vineyard blocks;
- Informed decisions on rootstock and clone selections for replanting;
- Determined similarities and differences between vineyard blocks to aid in viticulture decisions;
- Enhanced general understanding of vineyard *terroir* for improved winegrowing and winemaking;
- Not least important, provided new and fresh perspectives for marketing.

Perhaps our most significant discovery has been a direct correlation between a geologically definable deposit (at Stag's Leap Wine Cellars) and a winemaker's sensory evaluation. Here, the "sweet spot" of one vineyard block was independently defined and outlined based on geological parameters (Figure II).

Geology is a new and barely tested tool for winegrowers, winemakers, and marketers. It is also of potential interest to wine enthusiasts. In the words of David Jones, proprietor of Lava Cap Vineyards (Placerville, CA), "What you're tasting in a bottle of wine is 100 million years of geologic history."

The geologic perspective provides scientific data that can:

- Inform viticulture decisions;
- Offer a rational conceptual context encompassing other sources of information;
- Offer a historical account that enhances understanding of *terroir* for vineyard owners, workers, and the consuming public.

"The Foundations of Wine in the Napa Valley," and *The Winemaker's Dance* provide a detailed account of the geological underpinnings of the valley and the sediment cover that provides a home for vine roots. The first book is more technical, though both will be of interest to professionals.

Our detailed studies build on these publications and provide in-depth analysis of individual properties. Together, these two approaches comprise an expanded view of *terroir* that incorporates the history of the region with clear images of the underpinnings beneath the vineyards themselves.

The report contains 110 pages of text with 116 full-page graphics, many based on a 3-D topographic map of the AVA. Illustrations for the report were made possible through the book project undertaken with the cooperation of the U.S. Geological Survey. More information about these products and our approach to vineyard geology can be found through the site www.winemakersdance.com. ■

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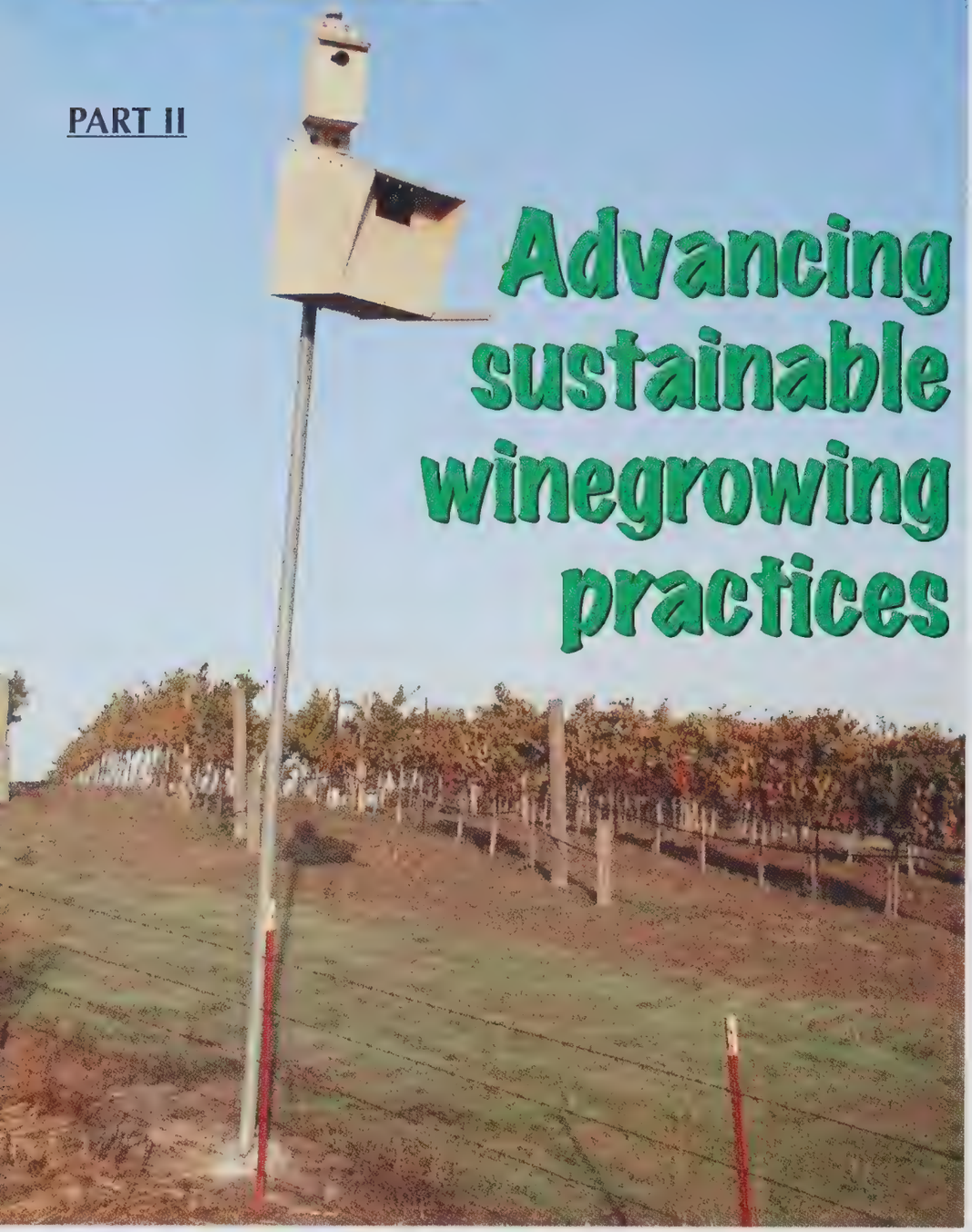
PART II

Advancing sustainable winegrowing practices



An American Kestrel box perches atop an owl nesting box along a fence on the Shafer Vineyards' Red Shoulder Ranch vineyard in Carneros region (Napa County, CA). For 15 years, the vineyard has five owl nesting boxes and several hawk perches, providing homes and hunting sites for raptors who control the gopher and mole population on the 70-acre property. (Photo by Andy Demsky)

In 2003, the Wine Institute and the California Association of Winegrape Growers (CAWG) established the California Sustainable Winegrowing Alliance (CSWA) to promote environmental stewardship and social responsibility in the California wine community.

In October 2004, CSWA released the results of a survey of attendees at more than 70 sustainable practices workshops. Participants were California growers and vintners who evaluated their vineyard and winery operations using a 490-page workbook of best management practices [the *Code of Sustainable Winegrowing*], which was developed by a joint committee of 50 members from the Wine Institute, CAWG, and other key stakeholders.

Results of the voluntary self-assessments are contained in the *California Wine Community Sustainability Report*. About 25% of the state's winegrowing acres and 40% of California's 260 million cases of wine production are represented in the report (see Figure I).

Survey results from two chapters of the sustainability report: Viticulture and Soil Management were published in ***PWV*** (November/December 2004). Below are results from the Pest Management chapter.

Pest Management

Winegrowers deal with pest problems throughout the year, whether pathogens, nematodes, insects, mites, weeds, vertebrates, or any combination thereof. Throughout centuries of farming, many approaches to pest management have been developed. Integrated pest management (IPM), best management practices, bio-intensive pest management, biological control, and certified organic pest management are a few common examples. There are ardent supporters of each individual approach.

All of these approaches have many common components, generally differing mostly in tactics relied upon or required for control.

In fact, all of these approaches stress safe and effective, information-based management as a fundamental principle and therefore fall under the umbrella of IPM. IPM is a sustainable approach to pest management based on monitoring for pests and their predators to determine the risks of economic losses, and if intervention is needed, combining biological, cultural, and chemical tools in a way that minimizes economic, health, and environmental risks.

The foundation of a sound IPM program is regular vineyard monitoring. Particular techniques for pest management may vary between vineyards, from year to year, between grape varieties, and from grower to grower, but all sustainable pest management strategies begin with knowing firsthand what is occurring in the vineyard. Finding and correctly identifying a problem as early as possible allows growers to take necessary action with minimal environmental intrusion and economic disruption.

Benchmark Data

1. Vineyard Monitoring is one of the most effective ways to discover a pest problem and effectively nip the problem in the bud if treatment is needed. 73% of growers monitor, or have their

Pest Control Advisor (PCA) monitor, vineyards for pests and their predators on a weekly basis and use the information to make pest management decisions. 47% keep a written record of what was found. 22% of growers or their PCAs monitor periodically, with 4% rarely monitoring.

2. Economic Thresholds and Pest-Natural Enemy Ratios should be developed by each grower for important vineyard pests through the collection of quantitative pest data and spray results compared to damage due to pests at various population levels. This eliminates unnecessary spraying, which creates potential for environmental and public health impacts and wastes money.

63% of the growers use economic thresholds in their control decisions. 19% assess the potential for natural biological control based upon amounts of Anagrus egg parasitism and mite predators present in a vineyard. 33% base control decisions on the presence of pests in a vineyard. 1% base decisions on the time of year (calendar basis) and past experience.

Sustainable pest management is never complete. Instead, it is in a state of continuous improvement, because growers have learned more about their crops, pests, and their natural enemies over time and have used this knowledge to refine monitoring programs.

By combining chemical, biological, and cultural control techniques to manage a pest problem, growers can develop a broad-based strategy that will still be successful even if one particular technique does not work.

An often overlooked but very important area of sustainable winegrape growing is sprayer calibration and proper spray coverage. Both are very important in minimizing negative impacts of spraying and optimizing the efficacy of a spray application. Simple maintenance of the equipment insures that sprayers are properly calibrated and nozzles are functioning properly.

When pesticides, such as insecticides, herbicides, and fungicides are used, safety is of paramount importance. Safety issues include establishing buffer zones in sensitive areas, minimizing drift by monitoring environmental conditions before applying materials, and properly handling the loading and cleaning of spray equipment at all times.

3. Use of Broad-Spectrum Insecticides and Miticides — When using pesticides, it is important to carefully consider the types of chemicals or materials and whether these pesticides might negatively impact non-target organisms. 12% of growers use no insecticides or miticides of any kind as a result of natural processes (such as natural enemies) and use of cultural controls. 47% consider the impact on beneficial insects and mites but never use broad-spectrum, long-residual insecticides and miticides. 36% consider the impact on beneficial insects and mites but sometimes use broad-spectrum, long-residual insecticides and miticides at the lowest rate possible. 2% never consider the impact on beneficial insects and mites and use broad-spectrum, long-residual pesticides on a calendar basis.

4. Reduced-Risk Insecticides and Miticides can be used with less harm to the environment and non-targeted beneficial insects and mites. 12% of growers use no insecticides or miticides of any kind as a result of natural processes (such as natural enemies) and use of cultural controls. 20% use only reduced risk materials if a treatment is necessary. 59% use reduced-risk materials in at least every other spray when a treatment is necessary. 5% never use a reduced-risk spray.

5. Cultural Practices for Insect and Mite Management, such as leaf removal, can be effective tools for specific pests like leafhoppers and mites. 81% of growers maintain vine vigor to a level appropriate to reduce pest pressure. 54% do leaf removal, and 26% practice non-tillage of the vineyard floor and, where relevant, sanitation (such as berm-sweeping). 10% use no cultural controls.

6. Dust Abatement In and Around Vineyards — For mite pests, minimizing dust in a vineyard helps deter outbreaks. 96% of growers control vehicle speeds on roads surrounding a vineyard. 67% maintain a permanent cover crop in a vineyard, and 46% of these seal the roads with environmentally acceptable sealants, or they water roads as necessary. 2% of growers do not use preventative actions for mitigating dust.

Figure 1
Vineyard workshop participation results:
- **813** distinct vineyard enterprises in California
- **223,971** acres farmed by participants (42.3% of 529,000 total statewide acres)
- **137,859** of their acres were assessed (26.1% of statewide acres)
- **614** enterprises submitted assessment results (75.5% of total enterprises)
- **124,576** acres were assessed and results submitted (23.5% of statewide acres)

7. Use of Weather Data and Degree-Days can add to the tools in a grower's sustainable winegrowing toolkit for specific pests, such as moths. Before taking remedial action, 44% of growers confirm problem population levels through in-field monitoring and economic thresholds. 7% also use data on captures from pheromone traps and from weather stations to calculate degree-days and determine best time for in-field monitoring and potential treatment. The other 32% of growers base treatments on time of year or stage of grapevine development. 1% treat for moths when it is convenient to do so.

8. Mite and Leafhopper Treatment — When pests are discovered in a vineyard, it might seem like good management policy to treat the entire vineyard to make sure that the threat is addressed. More often, this approach is the most expensive strategy to implement and the one with most risk potential. Treating specific areas of a vineyard where economic thresholds have been exceeded is both economically and environmentally sustainable. 69% of growers treat only the portion of a vineyard identified as exceeding the economic threshold (hot spots), with 38% also treating a buffer strip around the hot spot. 13% identify pest hot spots but treat the entire vineyard, and

3% treat the entire vineyard without identifying pest hot spots.

9. Employee Training — No one person can do all of the things necessary to operate a sustainable vineyard. Any operation that has employees should ensure proper employee training to identify insects and mites. 82% of growers train and encourage employees to monitor for insects and mites, with 8% providing the training information bilingually. 67% train employees to identify specific pests and associated damage.

10. Releasing Predatory Mites — Most living organisms have natural enemies that limit their populations. With mites on winegrapes, growers can release predatory mites to reduce numbers of pest mites. 3% of growers release predatory mites into historical hot spots and along upwind edges before grape-destroying mites build up. Prior to a release, 1% of these growers check for numbers of predators per vine and their viability. 7% of growers release predatory mites after a population of mite pests explodes. 59% of growers don't release predatory mites even if they are not already present.

11. Mealybugs are an increasing concern for growers, because the non-Pseudococcus mealybug, vine mealybug, is a voracious feeder that produces multiple generations each year. Since these relatively new pests are expanding their range, a proactive approach to pest management is good insurance for any grower.

15% of growers monitor their vineyards for mealybugs throughout the year, map the infested areas, treat ants (which tend the mealybugs) if necessary, and only treat infested vines with a handgun sprayer. 4% also monitor for parasitism, clean equipment of vine debris when moving between infected and non-infected areas, do not allow workers to work in infected and non-infected areas on the same day, and only make necessary applications against ants using environmentally sensitive materials. 17% treat a vineyard every year for mealybugs based on an annual monitoring program. 2% treat an entire vineyard every year without monitoring.

12. Vineyard Monitoring for Disease is in addition to monitoring insect and mite pests. 72% of growers or their PCAs monitor at least weekly and use the information to make management decisions. 34% of growers or their PCAs also keep a written record of what is found. 24% of growers or their PCAs monitor periodically, while 3% rarely if ever monitor.

13. Powdery Mildew Management is critical. Without control, the most significant disease in California vineyards could substantially reduce winegrape yield and quality. 85% of growers use cultural practices (such as leaf removal, shoot thinning, shoot positioning), make spray decisions based on weather patterns, rotate fungicides with different modes of action, and only use the organic compound sulfur throughout the season. 12% make spray decisions based on an established calendar program and rotate at least two fungicides of different modes of action; 1% of these use the highest label rates of materials and do not rotate.

14. Use of Reduced-Risk Fungicides is required in sustainable winegrowing, even in the face of major threats, such as powdery mildew. 58% of growers only use reduced-risk fungicides and rotate different modes of action every treatment. 34% of growers rotate reduced-risk fungicides with higher-risk materials, with 29% rotating different modes of action at least every season.

15. Canker Management — When developing a management strategy for disease-causing cankers, an integrated approach has the best potential for success. 72% of growers late-prune susceptible varieties to manage cankers. 47% also prune-off diseased wood and adjust machines to minimize spur damage if the fruit is mechanically harvested. 26% practice integrated disease management by marking diseased wood, removing it from the vineyard, and then destroying it.

16. Botrytis Management — Bunch rot of winegrapes is the most serious on tight-bunched varieties, such as Zinfandel, Riesling, Chardonnay, and Chenin Blanc. 64% of growers remove leaves around fruit to increase air circulation and implement practices to reduce physical berry damage. 8% also practice integrated disease management (such as trellis selection to increase air circulation, shoot thinning, leaf removal), destroy mummified fruit, and use weather data to time fungicide treatment. 72% of growers apply fungicides only at bloom and bunch closure or as protection against bunch rot during long periods of wet weather in the spring or pre-harvest. 1% make fungicide applications on a calendar basis.

17. Identification of Causal Agent of Bunch Rot is essential for selecting appropriate control measures. 40% of growers identify the casual agent as either sour rot or Botrytis. 15% also examine clusters for physical damage.

18. Pierce's Disease Management — Pierce's disease is deadly to vines and its causal agent can be transmitted by several flying insects known as sharpshooters. One of the primary vectors for this disease is the blue-green sharpshooter. 28% of growers remove vines with Pierce's disease from the vineyard as soon as detected and use yellow sticky traps to monitor for blue-green sharpshooters. 20% also use an advanced IPM approach to manage Pierce's disease that includes management of adjacent riparian areas. 2% of growers make insecticide treatments for blue-green sharpshooters on an annual basis.

19. Glassy-Winged Sharpshooter Monitoring — The glassy-winged sharpshooter (GWSS) is a devastating vector for Pierce's disease because of its size, ability to fly long distances, and efficiency of transmission of the disease-causing bacteria. Growers have placed such a priority on controlling the disease that they pay an annual assessment to the California Department of Food and Agriculture to curtail the spread of the disease and to find a containment solution for the GWSS.

69% of growers train employees in GWSS identification. 50% also conduct weekly monitoring with yellow sticky traps. 15% of growers do weekly monitoring of at least one yellow sticky trap for every 20 acres and for other traps positioned at key vineyard access points.

20. Vineyard Monitoring for Weeds should be continual, similar to that for other pests. 92% of growers or their PCAs monitor for weeds periodically. 13% keep a written record of the findings, with 6% of these growers monitoring at least bimonthly.

21. Weed Knowledge is required to be able to identify weeds and an understanding of the life cycle of weeds, so the most effective and efficient management strategy can be implemented. 64% of growers use a weed identification handbook or online photo gallery to identify weeds. 53% know the weeds in their vineyard, while the remaining 11% know life cycles of the weeds. 33% know the names of a few weeds in the vineyard. 2% rely on the PCA to identify weeds.

22. Herbicide Choice and Rate Reduction — One method for controlling weeds in a vineyard is the use of herbicides. The choice of herbicide and rate of application are important factors to consider for minimizing environmental impacts. 5% of growers use no herbicides, and weeds are managed with non-chemical practices that do not contribute to problems or increase the possibility of erosion. 43% use only foliar-applied, contact herbicides with selection of product and rate based solely on weed species and size. 37% use soil-applied pre-emergent herbicides applied at rates based on weed species and soil type. 14% use a catch-all tank mix to manage all weeds.

23. Herbicide Leaching Potential and Movement in Surface Water — The most important concerns with herbicide use are the possibilities of contamination of surface and underground water sources. Through its groundwater-monitoring program, the California Department of Pesticide Regulation has detected the herbicides simazine, diuron, and norflurazon in groundwater in California. 56% do not use these products. 13% use simazine, diuron, and norflurazon only every second or third year and only in areas of low leaching potential. 20% use simazine, diuron, and norflurazon annually but not on sandy, gravelly, or high water areas. 5% use simazine, diuron, and norflurazon according to legal requirements but do not specifically avoid use because of leaching potential or irrigation type in their vineyard.

24. Timing of Treatment of Perennials that are some of the toughest weeds to manage in a vineyard. 44% of growers treat perennials when they are the most susceptible and use mechanical weed management at the proper time. 48% treat tough perennials before they set seed, and 2% treat perennials after seeding.

25. Area Treated with Herbicides — As with pest management, treating hot spots in a vineyard for weeds is not only environmentally protective but also economically sustainable. 91% of growers tolerate some weeds in the vineyard. 84% maintain a small, treated berm, and 36% of growers additionally use foliar-applied herbicides to spot-treat instead of spraying the entire berm or vine row. 7% of growers with larger, treated berms tolerate some weeds while 4% do not.

26. Vineyard Monitoring for Vertebrate Pests must be done in addition to dealing with pests, disease, and weeds in an effort to produce winegrapes. 75% of growers or their PCAs monitor a vineyard at least monthly and train employees to identify vertebrate pest activity and damage. 12% of growers or their PCAs monitor bi-weekly and keep written records of what they find. 18% of growers or their PCAs monitor once a quarter or less.

27. Vertebrate Pest Management — Once vertebrate pests are found in a vineyard, it is important to develop a sustainable management plan for effectively dealing with them. 14% of growers manage vertebrate pests through habitat alteration (such as elimination of brush piles, cover crop selection) and/or by exclusion (such as bird scare devices, grow tubes with chicken wire), and if exclusion-fencing is used, it is directed only at target species. 55% of growers use habitat modification and/or exclusion techniques and use anti-coagulant or strychnine baits during outbreaks. 18% use anti-coagulant or strychnine baits on a regular basis with protection from ingestion by non-target organisms, or they use fumigants or explosive devices to control vertebrate pests, such as gophers.

28. Area of Vineyard Treated for Vertebrate Pests — Selecting the necessary area in a vineyard for treatment is an important element of the vertebrate pest management plan. 85% of growers only treat problem areas of a vineyard for vertebrate pests. 5% treat the entire vineyard.

29. Vertebrate Pest Predators can assist growers in controlling vertebrate pest populations, one of the benefits of a diverse ecosystem. 65% of growers provide an owl box for every 100 or less vineyard acres. Of these, 37% provide raptor perches. 7% have owl boxes for every 40 acres and also provide kestrel and bat boxes.

30. Low-Volume Vine Canopy Sprayers — If a grower decides to spray for pest management, it is important that the sprayer effectively, efficiently, and safely delivers the necessary amount of materials to targeted areas. 40% of growers use low-volume electrostatic sprayers or low-volume conventional sprayers. 29% use conventional sprayers delivering small droplets. 19% use conventional sprayers delivering large droplets. 4% use conventional dilute sprayers and do not know the droplet size.

31. Sprayer Calibration and Maintenance is another important consideration to ensure optimal performance. 63% of growers calibrate the sprayer and check coverage, replace worn nozzles every year, recalibrate when conditions dramatically change, and include sprayer components in the annual maintenance schedule. 36% check coverage with different row spacing or canopy density and monitor nozzle discharge if an electrostatic sprayer is used. 32% check nozzle wear and variation every other year or less, with 3% calibrating the sprayer every year.

32. Spray Coverage — Adjusting parameters to achieve proper spray coverage to a developing canopy over the season is important for effectively delivering spray to targeted areas. 93% of growers have the nozzles positioned and opened or closed as required by

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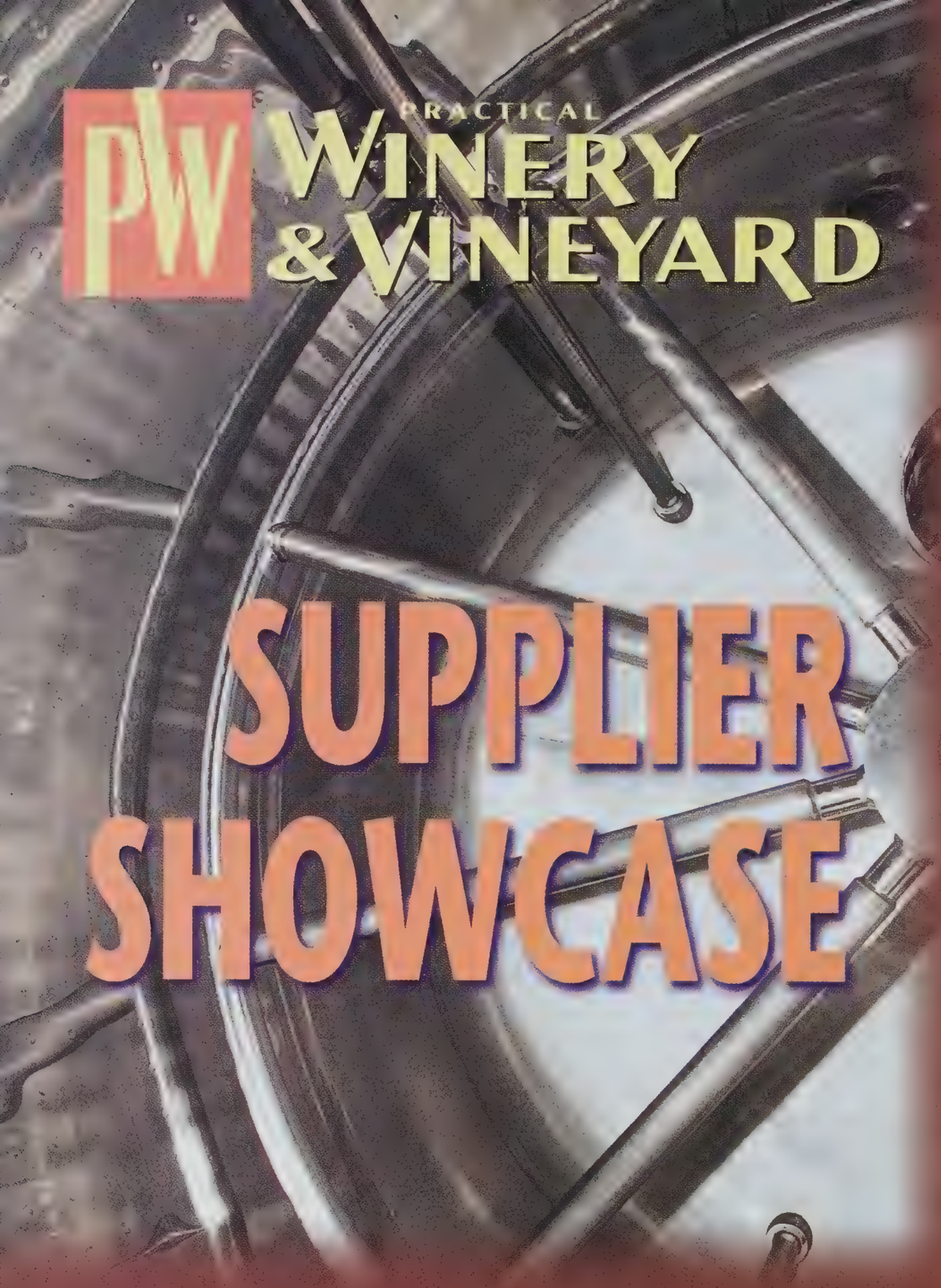
PRACTICAL WINERY & VINEYARD



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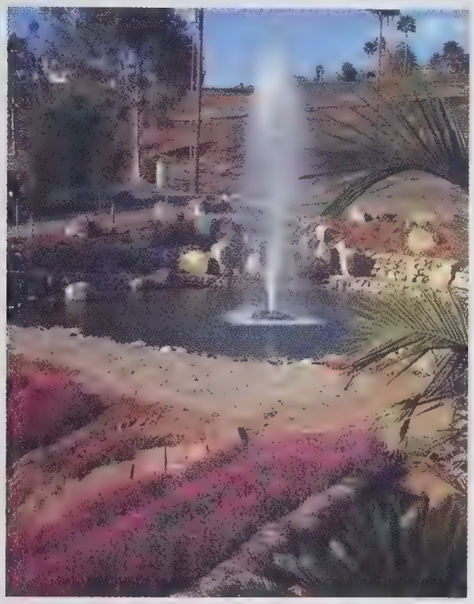
Kasco Marine, Inc.

Kasco Marine has been in business for over 35 years supplying pond aerators, deicers, and fountains for water quality improvement and aesthetic reasons. All products are designed for fresh or saltwater, to ship via UPS, and ETL-approved UL and CSA safety standards, and come with a two-year warranty. The Initial purchase price and operational costs are the lowest of any major manufacturer. Kasco Marine's units are affordable, dependable, efficient, and can help with algae control, odors, and general overall health of your pond.



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e-mail: ales@kascomarine.com
webite: www.kascomarine.com
PLEASE SEE KASCO MARINE AD, PAGE 87.

Pro Refrigeration, Inc.

Pro Refrigeration, Inc. offers a complete refrigeration equipment product line for the wine industry.

Pro has worked with some of the finest winemakers to develop a packaged glycol chiller system with special features, controls, and components valuable to a winery. Packaged systems are available from 3 HP to 120 HP covering almost any size facility.

Pro is more than a manufacturer of high-quality glycol chiller systems. Pro offers the Proformer™ Refrigeration equipment product line that includes glycol heat exchangers, condensing units, and direct expansion heat exchangers for storage room cooling.

Pro recently added the CR110 Microprocessor Controller, easily incorporated on any of the products offered. The CR110 provides improved system control as well as remote monitoring and control capability.

Pro knows and understands the important role that refrigeration equipment has in making and storing great wine, and is honored that many wineries have entrusted Pro with this responsibility, while looking forward to adding many more wineries to the list of companies entrusting their product to Pro equipment.

For more Information, contact:
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e-mail: jimvgjr@prorefrigeration.com
website: www.prorefrigeration.com
PLEASE SEE PRO REFRIGERATION'S AD, PAGE 66.

Savour Oak

Savour Oak offers the finest convection toasted Oak Integration Systems on the market. Savour offers a practical, economical, and ecological winemaking tool allowing winemakers to modify traditional methods without sacrificing quality. Savour Oak is available in Tank Stave Arrays, Stave Biscuits, Barrel Refreshers, and Barrel Renews.

Savour Oak™

Tank Stave Arrays and Biscuits deliver superior flavors with easy installation. Combined with a micro-oxygenation system, the Staves convert your tank into a hi-quality ageing system at a fraction of the cost of barrels.

Barrel Refreshers and Renews achieve new-oak barrel quality economically and efficiently. They also provide flexibility by allowing winemakers to change an American barrel into French or Hungarian.

Savour Oak is naturally seasoned for three years and is hand-selected exclusively for the wine industry. All products are available in French, Hungarian, or American oak. Stages of processing are carefully monitored to maintain premium quality, earning Savour Oak a reputation as a leader in oven-toasted oak products.

Look to Savour Oak for quality-driven products guaranteed to provide wineries with the most consistent and reliable flavor profile on the market.

Savour Oak is product under Newpak USA, a member of the Cork Supply Group.

For more information, contact:
Newpak USA — Savour Oak
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e-mail: sales@newpakusa.com
website: www.corksupplyusa.com
PLEASE SEE SAVOUR OAK AD, PAGE 42.

Knox Industries

Mel Knox represents some of the best cooperages in the world, including Tonnellerie Taransaud and Tonnellerie Freres.

Tonnellerie Taransaud (Merpins, France) supplies many kinds of barrels to the greatest wine estates in the world. The Taransaud secret is twofold: excellent stock of naturally air-dried wood (all age-certified by Bureau Veritas) and great attention to detail. For example, Taransaud uses a thermocouple to measure the temperature of barrels when toasting. Time and temperature are closely monitored, so there are no surprises.

Besides 225-liter barrels, Taransaud offers 350-liter, 400-liter, and 500-liter barrels, plus tanks, round casks, and ovals.

In 2000, Taransaud installed 56 oak tanks at Robert Mondavi Winery and eight special tanks at Harlan Estate, both in Napa Valley. These tanks have stainless steel tops with a removable inner cap ideal for fermentation and/or storage.

Tonnellerie Francois Freres is respected for its work with the top domaines of Burgundy, California, and the world. Both Burgundy and Bordeaux-shaped barrels are available.

The Francois Freres group acquired 50% interest in Trust International, a producer of Hungarian oak barrels. As the species of oak found in Hungary are the same as those found in France, barrels resulting from this alliance should be of interest to winemakers.

For more information, contact:
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PLEASE SEE KNOX INDUSTRIES' AD, PAGE 36.

Lloyd W. Aubry Co., Inc.

The Lloyd W. Aubry Co., incorporated in 1962, has specialized in design, fabrication, installation, and modification of equipment, machinery, material-handling systems, and related structural and piping work for the beverage industry for more than 40 years.

Successful completion of more than 9,600 projects has provided valuable knowledge, expertise, and experience to meet every customer's need, regardless of work scope and schedule requirements. Lloyd Aubry Co.'s field and management personnel take pride in their problem-solving abilities, quality of work, character, and aptitude for providing a safe, accident-free workplace.

In the last several years, Lloyd Aubry Co. has performed more than 250,000 manhours with an exceptional safety record. During this time period, its worker's compensation experience modification factor has averaged between 0.60 and 0.82.

Lloyd Aubry Co. builds and installs complete grape handling systems and bottling lines. The company works with both large and small wineries to produce results that reflect excitement, energy, and expertise.

With annual sales of $20 to $25 million, the Lloyd Aubry Co. is large enough to handle the most demanding projects and schedule requirements yet small enough to offer each customer the personal attention necessary to ensure a successful result.

Lloyd Aubry Co. maintains a full-line fabrication shop in Hayward, CA, and satellite operations in White City, OR, and Little Rock, AR.

For more information, contact:
Lloyd W. Aubry Co., Inc.
2148 Dunn Rd., Hayward, CA 94545
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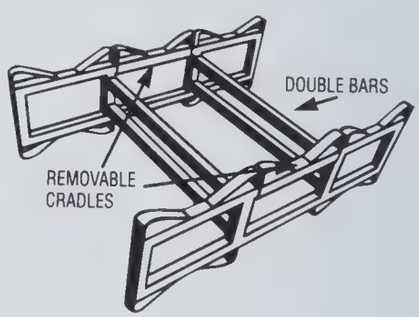
Western Square Industries

Western Square is the wine industry's largest supplier of portable steel barrel racks including stainless steel racks in two popular models, the double-inside bar (7-inch forklift opening) two-barrel rack and corresponding four-barrel rack.

Offered in powder-coated mild steel are the above two models plus a low profile (4-inch forklift opening) inside bar rack, so it is also a topping rack and a rack for the bottom tier of barrels, which can be pallet-jacked from any direction.

These standard models will accommodate all barrels from 200L to 275L. Special models are available. Regardless of which racks are used in your winery, Western Square can supply racks that will co-stack.

For wineries stacking barrels in pyramids, Western Square offers a cradle that replaces four chock blocks, thereby facilitating stacking.



Western Square offers two handy devices for holding a single barrel above two-barrel racks, useful when you have an odd number of barrels in a lot. One is the previously mentioned pyramid cradle, and the other is a removable center cradle (see photo with standard two-barrel rack).

Western Square offers a barrel-washing system specifically for use with portable racks.

For more information, contact:
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1621 N. Broadway, Stockton, CA 95205
tel: 209/944-0921; fax: 209/944-0934
e-mail: info@westernsquare.com
website: www.westernsquare.com

ARS/Pressure Washer Company

ARS/Pressure Washer Company announces the release of the new SWASH steam generator, built exclusively for ARS/PWC by Electro-Steam Generator Corp. Based upon experience with wineries for nearly 10 years, the Electro-Steam unit is redesigned to more reliably and conveniently meet your needs. Improvements include a convenient high/low pressure selection switch to easily change to the appropriate pressure for specific applications. The new stainless steel housing encloses all components for greater safety and ease of cleaning of the unit. Large pneumatic tires offer easy maneuverability.

New for the tasting room are Miele Professional high-quality dish and glassware washers. Combined with whisper-quiet operation, the units meet NSF requirements for sanitization and have two layers with a variety of tray inserts.

When you need to clean, sanitize, sterilize, or humidify anything in and around your winery, ARS PWC has the products and expertise to meet your needs. In addition to Electro-Steam and Miele, Hydro Tek pressure washers, Moog, high-pressure barrel washers, Bitard barrel rinsers from Bordeaux, and Fogmaster® barrel room humidifiers and spray misters are also available. Call for parts and accessories for any brand of pressure washer.

Showroom by appointment. Call and ARS PWC will demonstrate that, "We work well under pressure."

For more information, contact:
ARS/Pressure Washer Company
1184 Maple Lane, Calistoga, CA 94515
tel: 707/942-8330; fax: 707/942-8337
e-mail: info@arsenterprises.com
website: www.cleanwinery.com

PLEASE SEE ARS AD, PAGE 132.

Scott Laboratories

Willmes introduces two new series of presses, the SIGMA and the MERLIN.

SIGMA is the most universal, gentlest, fastest, and most economical tank press manufactured. It is complete with features to meet every conceivable press requirement: hermetically sealable, pressing when full, pressing of minimum quantity, simple controls, easy cleaning, and ultra-low minimum pressure (0.1 bar). This is all made possible by the central juice extraction system, which WILLMES has patented. The SIGMA is the technological core component of your grape processing operation and can be integrated into every operational process.

The SIGMA series is available in sizes from 500 liters to 34,000 liters.

MERLIN is the second new series from WILLMES designed for quality-conscious wine-growers with an affinity for pressing whole clusters and a requirement for considerable flexibility. MERLIN comes with an opening along the whole length of the drum cylinder. It is available with several detachable lids and also features the same central juice extraction drains as the SIGMA. The drains are quickly removed for hygienic and speedy cleaning.

The MERLIN series is available in sizes from 1,200 liters to 5,300 liters.

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PLEASE SEE SCOTT LABORATORIES' ADS, PAGES 30 AND 41.

TW Boswell

Experienced master coopers developed the TW Boswell collection which includes Legacy, Côte d'Or, and Médoc barrels. Each has a distinct personality built for distinct, reserve wines. Researchers have recently designed sensory profiles for each barrel.

For something more on the bashful side, the Côte d'Or provides traditional Burgundian toastiness, while encouraging fruit expression.

If you're looking for the expressive type, the Médoc barrel is made for more concentrated wines that suggest aging.

The charmer is the Legacy barrel that adds texture and maintains a proper balance of fruit and oak — with finesse.

Different toasting regimes used for the three distinct barrels are now monitored and repeated for exact consistency in quality. TW Boswell can provide product-profile sheets that show how the barrels are toasted and what winemakers can expect in terms of chemical and sensory attributes. These barrels provide old-world nuances with new-world consistency.

Côte d'Or and Médoc barrels (59-gallon capacity) are crafted of premium French oak. Médoc barrels are built from 30-month, air-seasoned oak. Legacy barrels have several options: standard or extra-fine grain, 59- or 70-gallon, 24- or 30-month air-dried oak, and is available in American, French, hybrid, or eastern European oak.

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PLEASE SEE TW BOSWELL AD, PAGE 9.

StaVin Incorporated

StaVin's cost-effective, versatile oak integration systems provide *traditional flavor and real economics*. French, Hungarian, and American oak is naturally seasoned for three years. To ensure thorough heat penetration and complex flavors, all oak is traditionally fire-toasted.

To replicate the benefits of winemaking in barrels within tanks, read about StaVin's oak and micro-oxygenation at www.micro-ox.com. Macro-aeration, the use of StaVin's Oak Bean and Segments to build structure and stabilize color in red wine, fermentation, and more are also discussed.

Packaged for convenience and savings, StaVin's Oak Beans deliver the oak flavors of 13 new French, Hungarian, or American oak barrels in one 20-lb bag. The food-grade nylon bag allows for easy retrieval and movement between tanks.

New barrels are expensive. Save by installing StaVin's barrel-quality French Oak Stave Segment (15-lb bag) or StaVin's Oak Stave Packs into your tanks. StaVin offers three tank configurations: the Tank Modular System, Tank Matrix, or the Tank Stave Fan.

Rejuvenate neutral barrels with complexity and traditional flavors, using StaVin's Oak Barrel Replica, Traditional Barrel Insert (now available in a new barrel extraction level), and Infusion Tube – plus reduce costs and conserve resources.

StaVin also represents Tonnellerie Saint Jacques French oak barrels.

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e-mail: info@stavin.com
website: www.stavin.com

PLEASE SEE STAVIN INC. AD, PAGE 11.

Santa Rosa Stainless Steel

Santa Rosa Stainless Steel (SRSS), one of the world's largest wine tank manufacturers, is in its 37th year of production.

SRSS builds tanks with capacities from one-gallon up to 700,000-gallon field-erected tanks. Each tank is finely crafted and passes through a rigid series of quality control checkpoints before shipment. Tanks are available on short notice from stock or may be custom-built to winery specifications.

Cooling jackets or panels can easily be added to existing tanks. SRSS press dimple jackets are quick to install in the field for retrofits to existing non-jacketed tanks for increased efficiency.

Jobsite retrofitting and tank repair are a large part of SRSS's expertise. In 2001, SRSS released a state-of-the-art, automatic punch-down unit that is installed in the tank and operated by an air cylinder above of the tank. The automatic control system is manufactured by Green Controls of Cloverdale, CA. Five units were installed and operated at Carneros Creek Winery for the 2001 crush.

SRSS can design and build tanks for micro-oxygenation. SRSS can also convert existing tanks for micro-oxygenation.

For more information contact:
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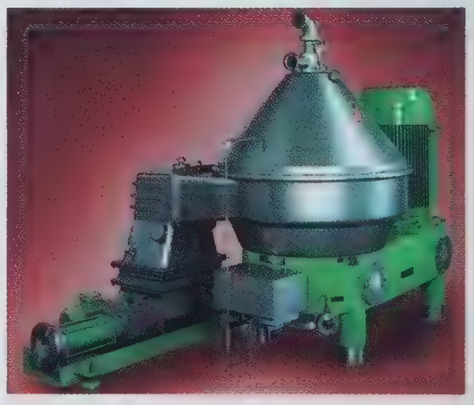
e-mail: rod@srss.com
website: www.srss.com

PLEASE SEE SRSS AD, PAGE 19.

Westfalia Separator, Inc.

Count on Westfalia Separator, Inc. to help you squeeze every drop of potential from vineyards.

Westfalia is a leading manufacturer of high-performance centrifuges and systems for the wine industry. A member of the Separator Division of GEA, Westfalia is uniquely positioned to provide innovative solutions that meet your separation requirements.



Westfalia's offers state-of-the-art, ready-to-connect separators and decanters for numerous processes useful to the wine industry including:

- wine clarification and polishing,
- wine recovery from lees,
- pre-clarification of lees,
- must clarification (including from a screw press and with combined flotation),
- highly efficient yeast removal,
- thickening of fining trub,
- thickening of lees from must tanks.

Conventional cooling processes can take a week to a month to separate tartrates. Westfalia's specially developed process for tartrate stabilization utilizes contact tartrate and can do the job in hours, allowing for fast production of ready-to-sell wines.

Westfalia also provides environmentally friendly disposal of yeast, separator, and fining trub.

With Westfalia Separator, customers "take the best — separate the rest."

For more information, contact:
Westfalia Separator, Inc.
100 Fairway Ct., Northvale, NJ 07647
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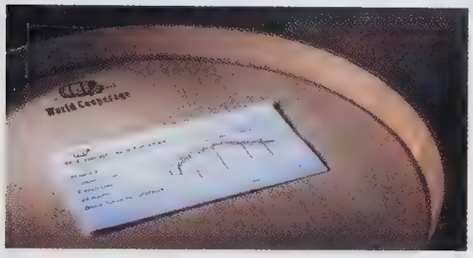
e-mail: salesinfo@wsus.com
website: www.wsus.com

World Cooperage

World Cooperage's unique "Barrel Profiling" toasting technology provides different barrel styles with diverse and definable flavor profiles and guaranteed repeatability and predictability. This innovation is in direct response to winemakers' request for consistency.

Research and development teams in Europe and the U.S. have been working on this toasting technology, combining the latest temperature sensors with a computer network and touchscreen monitors. The cooper simply inputs the barrel's wood specifications and desired toasting profile and the computer directs the cooper to increase, decrease, or maintain the barrel's current temperature to follow a desired profile.



World Cooperage works in partnership with customers to define a tailor-made profile, or winemakers can review the company's existing portfolio of barrel profiles. Once a winemaker has chosen a desired profile, World Cooperage uses the new toasting technology for perfect replication.

World Cooperage also produces Oak Alternatives with the same care as its barrels. Tank staves, barrel renewal systems, oak chips, and powder are toasted and monitored using similar infrared temperature sensors. Custom toasting is available. Also popular are High Vanilla oak chips and Premium Dark Roasted chips.

For more information, contact:
World Cooperage
Barrels: **Jason Stout, Yuri DeLeon, Jerry DeLorenzo, Gary Kroll**
Oak alternative specialists: **Paul Abbott**
2557 Napa Valley Corporate Dr., Ste. D
Napa, CA 94558
tel: 707/255-5900; fax: 707/255-5952
e-mail: info@worldcooperage.com
website: www.worldcooperage.com

PLEASE SEE WORLD COOPERAGE ADS, PAGES 33 & 140.

Winetech

Winetech has established itself as a turnkey provider of winery equipment, cellar supplies, and mobile filtration services. Its staff of winemakers and technologists work with customers to achieve the highest wine quality by complementing its technology and expertise with the vision and goals of the client.

Winetech distributes and services the world-class equipment of Della Toffola and Ju.Cla.S. These innovative designers of wine processing machinery produce crush equipment, presses, tanks, refrigeration, micro-macro oxygenators, and a full array of filters. Della Toffola engineers a highly efficient solution to any of the industry's processing requirements.

Winetech has deployed many of Ju.Cla.S and Della Toffola's processing innovations with its mobile services division. The range of services include:

- Lees filtration,
- VA adjustment,
- Crossflow filtration: ceramic and spiral-wound membranes,
- DE pressure leaf filtration,
- Brettanomyces treatment.

Enologica Vason has established Winetech as its exclusive distributor of award-winning cellar supplies. Yeast, nutrients, enzymes, tannins, fining agents, filter media, and other cellaring aids are stocked and available for immediate shipment.

Winetech provides the resources needed to choose the best winemaking technologies and supplies. Customers get the best of Europe at the right price and on time.

For more information, contact:
Winetech
PO Box 6888, Napa, CA 94581
tel: 707/552-2080
toll free: 877/4WINETECH
fax: 707/552-2117
e-mail: filtration@winetech.us
website: www.winetech.us

PLEASE SEE WINETECH AD, PAGE 70.

Euro-Machines, Inc.

Euro-Machines has introduced the Euroselect Destemmer and Selector in winery installations in California and throughout the West Coast, also on the BRAUD Grape Harvester. The Euroselect Destemmer is designed for sorting table feeding with optimum removal of stems and jacks. The same Euroselect system installed on the Braud Harvester, Type VL, allows the winery to receive machine-harvested grapes, clean of any stems or jacks, ready for whole berry fermentation without any further handling.

The Euroselect has three adjustable frequency drive motors for the Destemm Finger Drive of First and Second Selection, and Belt Drive. The solid stainless steel construction weighs 725 lbs, but is mobile on four swivel wheels with brakes.

Euro-machines is now offering the EUROPRESS, type EVP, all stainless steel basket press with 900L or 1500L capacity. Custom sorting tables, conveyor belts, and receiving stations are also available.

For innovative state-of-the-art solutions from BRAUD harvesters through crush pad equipment such as the EUROPRESS to custom RIEGER tanks, you can count on Euro-machines.

For more information, contact:
Euro-Machines, Inc.
West Coast
4950 Fulton Dr., Ste. E, Cordelia, CA 94534
tel: 707/864-5800; fax: 707/864-5879
e-mail:mattateuro@aol.com
website: www.euromachinesusa.com
East Coast
PO Box 843, Culpepper, VA 22701
tel: 540/825-5700; fax: 540/825-5789
e-mail: bernd@euromachinesusa.com

PLEASE SEE EURO-MACHINES' AD, PAGE 91.

Hansel Leasing, Inc.

Hansel celebrates 45 years of leasing excellence in 2005. As a full-service leasing company, Hansel Leasing provides leasing for new and used vehicles and equipment. Every lease is customized to suit the specific needs of the client.

We Lease Everything!

Hansel Leasing knows the wine business. Stephen E. Hansel, president of Hansel Leasing, is owner/winemaker of Walter Hansel Winery in Santa Rosa, CA. His hands-on experience and knowledge have been instrumental in making the company what it is today — a leading leasing resource for the wine industry.

As a direct lender, Hansel Leasing's professionals are able to make credit decisions, create documents, and pay vendors in a timely manner. The staff's goal is to make every transaction simple and convenient for clients and their suppliers.

Hansel Leasing can provide lease-financing for your winery. The portfolio includes leases for: crushers, presses, bottling lines, stainless steel tanks, oak wine barrels, refrigeration systems, barrel racks, vineyard wind machines, sorting tables, forklifts, tractors, seeders, and sprayers.

Need to lease something not on the list? Contact Hansel Leasing and see what the company can do.

"When you lease with Hansel Leasing, you are working with the very best."

For more information, contact:
Hansel Leasing, Inc.
Jim Taylor, Lease Manager
PO Box 3437, Santa Rosa, CA 95402
tel: 707/544-2822; fax: 707/578-8306

PLEASE SEE HANSEL LEASING AD, PAGE 84.

Kelvin Cooperage

Kelvin Cooperage offers premium American and French oak wine barrels in all styles and sizes, including Bordeaux and Burgundy with both 24- and 36-month air-dried oak. The staves are exposed to Kentucky's ideal climate for seasoning oak.

Kelvin Cooperage has been family-owned and operated since its founding in 1963. Kelvin Cooperage's attention to detail at every stage of the process, from oak selection to final testing of barrels, ensures that you receive the best barrel possible. The toasting process guarantees a deep, penetrating, and consistent toast from year to year.

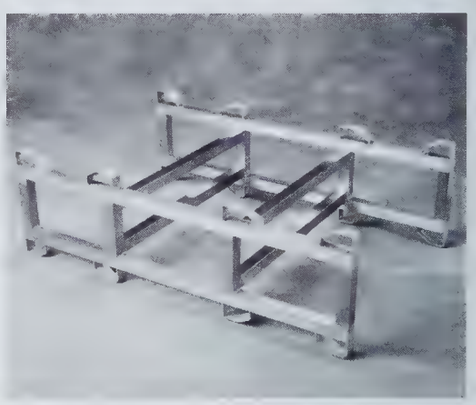
In addition to American oak barrels, Kelvin Cooperage offers premium French oak barrels from tight-grain, hand-split Allier oak air-dried for no less than 24 months.

French and American convection-toasted, two-year air-dried oak chips packaged in FDA-approved infusion bags are now available from Kelvin Cooperage.

For more information, contact:
Kelvin Cooperage
Ken Seymour, Sales Manager
tel: 707/526-7567, cell: 707/280-5500
fax: 707/578-5589
e-mail: ken@kelvincooperage.com
website: www.kelvincooperage.com

G.W. Kent, Inc.

G.W. Kent, Inc. supplies a full line of tanks, winery processing equipment, stainless steel barrel racks, fittings, and valves. Their stainless steel barrel racks have replaced many rusty metal barrel racks in wineries all over the U.S.



In conjunction with offering stainless steel barrel racks that out-shine competition, G.W. Kent also offers competitive prices and quick delivery from stock or custom production. By reducing labor and maintenance costs, stainless steel barrel racks are an investment that pays for itself in less than three years.

For more information, please contact:
G.W. Kent, Inc.
3667 Morgan Rd, Ann Harbor, MI 48108
tel: 800/333-4288, or 734/572-1300
e-mail: info@gwkent.com
website: www.gwkent.com

PLEASE SEE G.W. KENT AD, PAGE 13.

Electro-Steam Generator Corp.

Electro-Steam Generator Corp. has manufactured all-electric steam generators since 952.

The generators operate at 98% efficiency and produce culinary-grade steam. They are designed for point-of-use placement or with portable mounting. Some of the many uses include: sterilizing bottling lines, melting tartrates, refurbishing barrels, and general cleaning.

Because there is no open flame, Electro-Steam generators are safe to operate resulting in lower insurance costs.

Basic maintenance will extend the life of an Electro-Steam unit by many years.

Each generator is hand-built to meet your requirements. The units are manufactured under the ASME Code, are national board of PVI shop-inspected, and UL- and ETL-certified. CSA certification is provided upon request.

For more information, contact:
Electro-Steam Generator Corp.
1000 Bernard St., Alexandria, VA 22314
tel: 800/634-8177; fax: 888/783-2624
e-mail: jharlin@electrosteam.com
website: www.electrosteam.com

Vogelsang Wine Pump Division

One pump that will handle your must, lees, pump-over, pomace, and even juice?

Hard to believe, but true! Why have several large volume California wineries switched to the Vogelsang rotary lobe pump? It's simple, Vogelsang's lobe design treats the grapes better, and everyone knows that better grapes mean better wine, and better wine means better profit.

Vogelsang's exclusive elastomer-coated HiFlo lobes provide the most grape cluster-friendly pumping action in the wine industry. Choosing Vogelsang means you can move grapes into tanks without smashing the grapes, skins, or seeds. Unlike metal lobe or progressing cavity pumps, Vogelsang pumps won't jam or suffer damage from debris such as staples, stones, or twigs commonly found in grape clusters.

VOGELSANG

By eliminating liquid shear; unlike high-shearing centrifugal pumps, Vogelsang pumps allow you to extract more flavor out of your must through longer pump over.

Vogelsang pumps come on a versatile and mobile cart assembly for multi-task applications. Also offered are larger flow stationary assembled pumps that are perfect for any winery application.

To find out more about Vogelsang or schedule an on-site demonstration, visit: www.winepump.com, or call 800/984-4800.

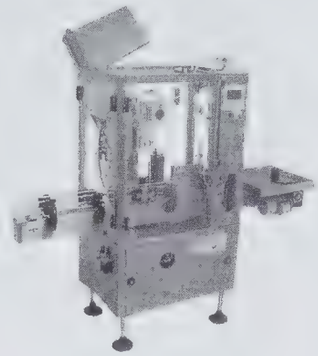
For more information, contact:
Vogelsang
Wine Pump Division
7966 State Route 44, Ravenna, OH 44266
toll free: 800/984-9400; fax: 330/296-4113
e-mail: sales@vogelsangusa.com
website: www.winepump.com

PLEASE SEE VOGELSANG AD, PAGE 48.

Criveller Company

Criveller Company has supplied the wine and beverage industries for over 25 years!

Criveller's Windsor, CA, office is in place to expedite customer service for wineries in California, Oregon, and surrounding western states.



Criveller carries a wide variety of processing equipment for every winemaking phase and fabricates stainless steel tanks to customer specifications. Red wine fermenters with a mobile plunger are available.

In conjunction with leading manufacturers of bottling and labeling equipment, Criveller offers manual, semi-automatic, or fully automatic bottling lines, including cost-effective monoblocs and triblocs that cater to all bottling needs.

Criveller's warehouses in Niagara Falls, Canada, and Windsor, CA, stock various models of bottling equipment, filters, destemmer/crushers, presses, and stainless steel tanks, including variable capacity and mini-tanks, for customer inspection.

For more information, contact:
Criveller Company
West Coast: Criveller California Corp.
Bruno Criveller or **Kimberly Rickman**
10350 Old Redwood Hwy.
Windsor, CA 95472
tel: 707/838-2222; fax: 707/838-2242
e-mail: crivca@sonic.net
Bruno or **Mario Criveller**
6935 Oakwood Dr., Niagara Falls
ONT L2E 6S5
tel: 905/357-2930; fax: 905/374-2930
e-mail: info@criveller.com
East Coast
PMB 202
1623 Military Rd., Niagara Falls, NY 14304
tel: 905/358-5202

PLEASE SEE CRIVELLER COMPANY AD, PAGE 96.

Nadalie USA

Established in 1980 and formerly known as Tonnellerie Francasie, Nadalie USA continues as the first French cooperage in the U.S. to manufacture American oak wine barrels, crafting them in the classic French-traditional style and tailored to enhance the unique qualities American oak brings to great wines.

NADALIE
USA

The *ADD IN* department headed up by Aurelia Rivier has expanded with the addition of Jennifer Dippe. This alternative wood product department has expanded by offering a range of products from powder to tank staves. Following a one-year study of product differences, an extensive report, *THE ALCHEMY OF OAK ADD INS,* has been printed that identifies the differences between products in wine over time — call Aurelia or Jennifer for a copy.

The *BARREL* department has a couple new faces — Chris Hansen recently joined the team to focus on Napa County and the Northwest, while Jamie Clark services Sonoma County and the southwest U.S.. Tom Cottrell continues to represent Nadalie on the East Coast.

Nadalie maintains high consistency and quality of product, attention to customer specifications, and a common desire for perfection through manufacturing in Calistoga, CA, and Bordeaux and Burgundy (Marsannay) in France.

For more information, contact:
Nadalie USA
Duane Wall, Alain Poisson ,Tom Cottrell, Aurelia Rivier, Jennifer Dippe, Chris Hansen, Jamie Clark,
1401 Tubbs Lane, Calistoga, CA 94515
tel: 707/942-9301; fax 707/942-5037
e-mail: nadalie@napanet.net
website: nadalie-usa.com

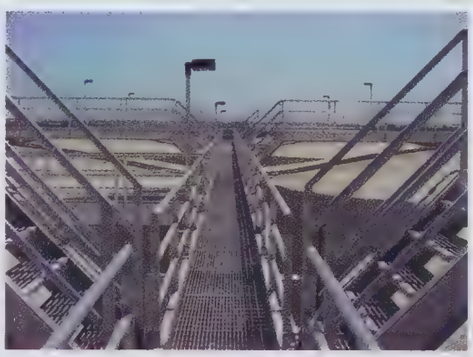
PLEASE SEE NADALIE USA'S AD, PAGE 23.

Ogletree's, Inc.

For 58 years, Ogletree's has specialized in custom fabrication of winemaking equipment. By relying on the continual pursuit of innovation and the company's historical stability, Ogletree's is able to optimize value and quality to satisfy the wine industry's needs, while providing customers with the security that the job will be done right the first time.

Ogletree's manufactures high-quality hoists, receiving hoppers, belt and screw conveyors, sorting systems, transfer lines, catwalk systems, and more. Ogletree's provides maintenance on all equipment offered.

Ogletree's years of service to the wine industry serve as a foundation to its design team. The team designs a superior product by collecting input from clients and focusing on their specific needs. By utilizing solid quality-control procedures and a precise six-point inspection, Ogletree's team of experienced fabricators deliver products second to none.



Since 1946, Ogletree's has proven to be a valuable asset to wineries, offering innovative solutions to help winemakers distinguish their wines in a competitive marketplace. The company's commitment has never changed. Ogletree's provides high-quality fabrication to customers with excellent value and on-time delivery.

For more information, contact:
Ogletree's
935 Vintage Ave., St. Helena, CA 94574
tel: 707/963-3537; fax: 707/963-8217
e-mail: rono@ogletreecorp.com

PLEASE SEE OGLETREE'S AD, PAGE 39.

Acrolon Technologies, Inc.

Acrolon is a leading supplier of Web-based cellar automation solutions.

Its TankNET® system, introduced for harvest 2000, was a first of its kind. Since then, TankNET® has become a standard for Web-based temperature control and fermentation management.

In 2005, Acrolon introduces another industry first — **Power Line networking.** Available in its flagship TC-1 controller and new, lower cost PL-1 thermostat, power line networking dramatically reduces installation costs by eliminating the need for separate tank-to-tank network cabling. With power line networking, communications is sent over the same electrical wires that supply power to the thermostats.

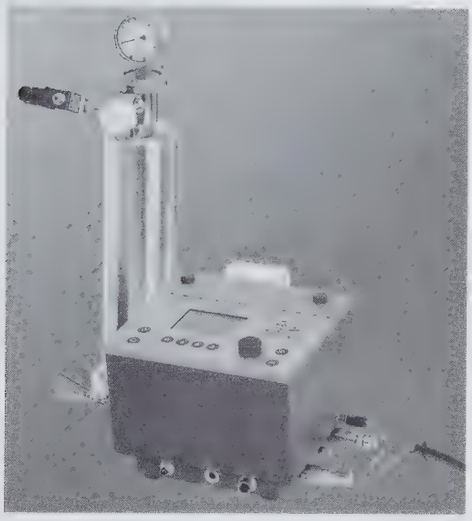
TankNET® features include:
- Anytime/Anywhere accessibility via web-browser,
- Multi-user/Multi-level access control,
- Automated heating and cooling,
- Brix, temperature, and pump-over tracking by lot code,
- Custom, animated cellar maps and reports,
- Real-time data logging, trending, and archiving,
- Instantaneous alarms via cell phones or email.

Expansion options available with the TC-1 include:
- Scheduled pump-overs and Brix monitoring,
- Humidity and CO_2 management,
- Stuck valve and level detection,
- Strati-probe™ deep, multi-point temperature monitoring.

For more information, contact:
Acrolon Technologies, Inc.
19229 Sonoma Hwy., Sonoma,CA 95476
tel: 707/938-1300; fax: 707/938-1342
e-mail: info@acrolon.com
website: www.acrolon.com

Pall Corporation

Precise separations are crucial to the quality, taste, and color of wine. Final filtration before bottling eliminates the risk of microbial contamination, therefore protecting the quality of the final product while maintaining brand awareness. Integrity testing of a final filter with the Palltronic® Compact Star is a reliable, cost-effective, and operator-friendly method to assess filter integrity. Manual test variability can be alleviated and test results can be printed for process documentation.



The Palltronic Compact Star unit is a fully automated device designed to perform forward flow measurements using the pressure decay test method. This is a simple, fast, and accurate check of filter integrity. By automatically pressurizing the filter housing at a predetermined test pressure, the unit stabilizes the pressure and carries out the measuring phase. Test results provide a clear and accurate indication of filter integrity prior to use.

Installed with a variety of operating languages and measuring unit selections, this portable system is capable of testing small capsules up to very large installations.

For more information, contact:
Pall Corp. North America
Nicole Madrid, General Sales Manager
2200 Northern Blvd., East Hills, NY 11548
tel: 516/801-9482

PLEASE SEE PALL CORPORATION'S AD, PAGE 64.

The Boswell Company

The second most important tool in winemaking is oak barrels. The Boswell Company provides specialized production from small coopers with integrity.

Each cooperage builds less than 75 barrels per day. These classic workshops make wine barrels without rushing. Oak sourcing, stave selection, and seasoning regimes are fully controlled. Toasting processes are easily customized. Family management promotes consistency, accountability, and direct communication.

Tonnellerie de MERCUREY makes Burgundy barrels for Pinot Noir, Chardonnay, and Syrah. Tonnellerie BERGER is the local cabinetmaker for Cabernet Sauvignon in the Medoc. Jean-Louis BOSSUET is a forest expert whose barrels are used with Merlot, Cabernet Franc, and Cabernet Sauvignon.

ROBERTS & Son (Cloverdale, CA) offers limited production of new French, American, or Hungarian oak barrels in 2005. A genuine barrel guru, Keith Roberts has created three of the seven cooperages in California. His son Nathan is production manager and virtually grew up around barrels with his father.

The Boswell Company continues to offer innovative cellar tools, including each of The Boswell's domed and "fatlip" silicone bungs, Ferm-rite fermentation bungs, French glass wine thieves, stainless steel stirring rods, and sponge hose-cleaning balls to help winemakers maintain wine quality.

For more information, contact:
The Boswell Company
1000 Fourth St., Ste. 640
San Rafael, CA 94901
tel: 415/457-3955; fax: 415/457-0304
website: www.boswellcompany.com

PLEASE SEE BOSWELL COMPANY ADS, PAGES 29 AND 135.

JV Northwest, Inc.

Fermentation tanks with pomace-out sweeps and center auger are available from JV Northwest, Inc. (JVNW).

Manual pomace removal in large tanks violates OSHA safety regulations and creates a bottleneck for efficient winery operations. The JVNW pomace-out tank, eliminates manual pomace removal entirely. The tank evacuates pomace in less than 20 minutes and, in some applications, as few as eight minutes.

The tank discharge is outfitted with an over-sized knife gate valve. The bottom cone, built in the shape of an inverted dish, includes a cooling jacket for precise temperature control.

Non-contact sweeps automatically clear the inverted tank floor with minimal maceration of whole berry clusters and a central auger helps eliminate bridging of the cap. Seed extraction ports can be built into the cone.

Customers report that the tank has resulted in an increased consistency of product.

The pomace-out mechanism can be added to existing wine tanks.

For more information, contact:
JV Northwest, Inc.
390 S. Redwood St., Canby, OR 97013
tel: 800/331-5869 or 503/263-2858
fax: 503/263-2868 or
503/263-1829 (Engineering)
e-mail: tanks@jvnw.com or parts@jvnw.com
website: www.jvnw.com

Tonnellerie Radoux USA, Inc.

The skills of Tonnellerie Radoux's master coopers are crucial to selecting the finest *Haute Futaie*-grown oak from forests maintained for hundreds of years under strict French regulations. Only the tightest-grained oak is selected from the Center of France, Vosges, and central European areas, and American white oak from Missouri, Minnesota, and the Appalachian regions.

In 2005, French oak and American oak barrels, puncheons, chips, and stave-inserts are offered, and Tonnellerie Radoux will continue to create the oak fermentation and ageing tanks that were founder Robert Radoux's original focus.

Each barrel is produced to meet a wine's and winemaker's distinctive style and personalized service is reinforced by strict quality control to ensure consistency.

Just as the sun influences the maturity and flavor of grapes, the toasting process gives each barrel its aromatic qualities. Being accustomed to winemakers' styles and objectives is essential to achieve the appropriate balance between wine and wood.

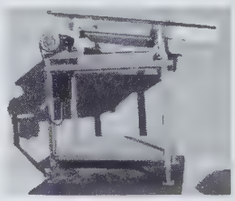
The cooper's art requires an expertise and skill handed down from generation to generation. At Tonnellerie Radoux, commitment and pride in its work are a deep-rooted tradition that is passed down through training programs that teach apprentices techniques that have withstood the *taste* of time.

For more information, contact:
Tonnellerie Radoux USA, Inc.
480 Aviation Blvd., Santa Rosa, CA 95403
tel: 707/284-2888; fax: 707/284-2894
e-mail: pmichel@radoux-usa.com
website: www.tonnellerieradoux.com

P&L Specialties

P&L Specialties provides comprehensive design, fabrication, and installation of winery equipment.

Since 1984, P&L Specialties' reputation has been built upon delivering the finest crush pad and hand-sorting systems. In 2003, the CME product line was launched featuring peristaltic pumps, destemmers, and vibrating sorting tables.



P&L Specialties announces the release of a new sorting machine, the "Le Trieur" (in French, *trieur* means to select or sort). Le Trieur is a proprietary post-destemmer sorting unit that removes an astounding amount and variety of material other-than-grape (MOG) including raisins, shot berries, stem particles, pebbles, and insects. Its unique design delivers a dramatic step forward in wine quality.

Le Trieur can be purchased separately or fitted to your existing equipment. Le Trieur shaker-type sorter is a P&L Specialties proprietary design and patent protection is being sought.

P&L Specialties has acquired a state-of-the-art fabrication facility. It is fully equipped with advanced tooling and staffed with experienced craftsmen.

Products include: sorting tables, receiving hoppers, belt and screw conveyors, 35lb. lug washers, half-ton bin dumpers and washers, pump-over carts, catwalks, destemmer stands, press loading hoppers, rotary screens, "Brix Buddy," cellar equipment, and many custom-fabricated items.

P&L Specialties offers regularly scheduled maintenance programs for your equipment.

For more information, contact:
P&L Specialties
Steve Eckles, Sales Manager
1650 Almar Parkway, Santa Rosa, CA 95403
tel: 707/573-3141, mobile: 707/849-8408
toll free 888/313-7947; fax:707/573-3140
website: www.pnlspecialties.com
e-mail: plsales@pnlspecialties.com
PLEASE SEE P & L SPECIALTIES AD, PAGE 56.

Atago USA, Inc.

ATAGO is celebrating 65 years of manufacturing and design of reliable, accurate, and dependable refractometers for the winemaker, vineyard owner, and grape grower. ATAGO products are ISO 9001 certified, and are currently used in more than 100 countries worldwide.

ATAGO's new "Pocket" PAL-1 combines the latest technology with innovative design to produce a low-cost, easy to use, handheld digital refractometer. Used to measure the °Brix of grapes and other fruits and vegetables, this refractometer is quickly becoming ATAGO's most popular item with over 30,000 sold worldwide since release in June 2003.

Widely used in the grape and wine industry, the PAL-1 features a digital display, automatic temperature compensation from 10° to 60°C, and the ability to be washed under running water (extremely water-resistant). These features eliminate the difficulty of reading an analog scale, the need for temperature conversion charts, and repeated repairs due to the ingress of water.

For quality wines use a quality refractometer. The PAL-1 is the "Next Generation Refractometer" priced to fit any budget, only $295!

For more information, contact:
ATAGO USA, Inc.
12011 Bel-Red Road, Suite 101
Bellevue, WA 98005
tel: 1-877/ATAGO-USA (877/282-4687)
fax: 425/637-2110
e-mail: wine@atago-usa.com
website: www.atago.net
PLEASE SEE ATAGO USA'S AD, PAGE 73.

Innerstave

Since 1979, Innerstave has been at the forefront of all alternative oak products for fine wines. Thanks to Innerstave's consistent supply of two-year-old aged French and American oak, Innerstave has been a respected provider to the wine industry for 25 years. All Innerstave oak products come from the finest forests and are enriched with a unique toasting process.

Innerstave
shaping the taste of fine wine

Innerstave works closely with winemakers in choosing appropriate products for their needs. Innerstave offers Tank Innerstave, Barrel Innerstave, Fan Innerstave, Chain of Oak, Bag of Blocks, Oak PLUS Oak Chips, and Oak PLUS Oak Flour. Innerstave products are used worldwide.

In addition to expert wood preparation and the ability to toast to a consistent flavor profile, Innerstave employs the finest group of coopers in the oak barrel alternative business. Innerstave's team will deliver more than you expect in service and quality!

For more information, contact:
Innerstave
Philippe Michel
24200 Arnold Dr., Sonoma, CA 95476
tel: 707/996-8781; fax: 707/996-1157
e-mail: sales@innerstave.com
website: www.innerstave.com

PLEASE SEE INNERSTAVE AD, PAGE 38.

Westec Industries

Westec Tank / Industrial Refrigeration & Process Piping (IRAPP), part of the Alary Corporation, is a leader in the wine industry and is offering equipment to food and beverage processors and other industries. Westec has taken its skills of fabricating 100- to 350,000-gallon stainless steel tanks and combined it with IRAPP's skills of designing and building one-to 3,000-ton refrigeration systems into a patented VT self-contained stainless steel tank. You can heat or cool wine all within this one unit. It runs off 220 power. It can be configured in open-top, closed-top, floating-top, or removable-top. It is a piece of equipment every winery and winemaker should have.

In 2004, the Alary Corporation introduced the OX BOX, a micro-oxygenation process in stainless tanks instead of oak barrels. If you combine the VT with the OX BOX, you have two pieces of equipment in one.

These are just two new additions to the Alary Corporation's one-stop shop. If you are starting, expanding, or building a winery, you only have to make one call for your equipment needs. Imagine dealing with one company instead of five.

Alary Corporation's refrigeration packages, stainless steel tanks, catwalks, wine lines, must lines, and sump carts, are second to none.

For more information, contact:
Westec Industries
Joe Belli, Vice President
1402 Grove St., Healdsburg, CA 95448
tel: 707/433-9471

Barrel Master

The "Barrel Master" self-supporting rack, first introduced in Australia, is now available in the U.S. The "Barrel Master," a convenient, safe, and labor-saving barrel racking system, is a unique design that is substantially more "stack stable" than competitors. Stacks up to eight high with modules to suit all barrel styles. Hot-dip galvanizing ensures a rust-free finish that will last a lifetime. "Barrel Master" racks are made in the U.S., are ISO-9001 certified, and come with a 10-year warranty.

Special features include:
1. No weight on barrel,
2. No need to have same size barrels at each level,
3. Allows for just one barrel at any level,
4. Bigger footprint on floor for greater stack stability,
5. Forklift entry from both ends with anti-tipping bars,
6. Round, smooth saddles that won't "dig in" when turning or positioning barrels,
7. Excellent access for "top up" and "sampling,"
8. Rack specifications: 63.32 inches long x 34.4 inches deep x 37.4 inches tall. 2½-inch steel tubing, hot-dipped, with galvanized finish.

For more information, contact:
Barrel Master
Ken Seymour
tel: 707/526-7567, mobile: 707/280-5500
fax: 707/578-5589
e-mail: ken@kelvincooperage.com
website: www.kelvincooperage.com

PLEASE SEE BARREL MASTER AD, PAGE 80.

Tonnellerie Saury

Harvest: subtle, fickle, unpredictable.

It's all about confidence.

Every year, skillful winemakers rise to, relish even, the challenge of the unpredictable. Winemaking is, after all, a craft, a science, and an art form. A winemaker's individual style and the flair born of confidence combine to create wine that will be unique, yet still carry the unmistakable stamp of the vineyard and its creator.

If winemaking is all about confidence — it's all about control. The coopers at Tonnellerie Saury understand their craft and its importance to you. A barrel is a tool in your palette, and you choose a type of barrel as a perfect complement to your wines.

Tonnellerie Saury provides you with the option of either immersion-bent or fire-bent barrels, as well as French, American, and Eastern European oak — all tight-grain stave selections that are aged for 2-1/2 years. Saury's rigorous standards provide you with a consistent tool to help you deal with the unpredictability of the vintage.

Let Tonnellerie Saury show you why so many winemakers use its barrels with confidence.

For more information, contact:
Tonnellerie de Correze, USA
Bayard Fox, U.S. representative
PO Box 672, Rutherford, CA. 94573
tel: 707/944-1330; fax: 707/944-1370
e-mail: info@sauryusa.com

PLEASE SEE TONNELLERIE SAURY AD, PAGE 14.

St. Patrick's of Texas

St. Patrick's supplies equipment for small to mid-size wineries from three warehouses covering 25,000 sf in Austin, TX. Product descriptions and pricing are available online at www.stpats.com. Equipment manuals are also available online.

St. Patrick's of Texas stocks the following equipment:

- Electric corkers with vacuum/gas,
- Pneumatic corkers,
- Monoblocks (filling and corking),
- Manual and semi-automatic labelers,
- Enoitalia crusher/destemmers,
- Wine tanks,
- Membrane, hydraulic, water, and ratchet presses,
- French oak barrels,
- Pumps,
- Stainless steel valves and fittings,
- Wine hose and clamps,
- Refractometers, hydrometers, pH meters,
- Heat shrink and foil applicators,
- Norcor corks,
- Rotary vacuum, lees, plate, and cartridge filters,
- Filter sheets and media,
- Filling machines.

For more information, contact:
St. Patrick's of Texas
1828 Fleischer Dr., Austin, TX 78728
tel: 512/989-9727; fax: 512/989-8982
e-mail: stpats@bga.com
website: www.stpats.com

PLEASE SEE ST. PATRICK'S AD, PAGE 82.

Gamba USA

Fabbrica Botti Gamba is a family-owned and operated, 215-year-old cooperage located in the Piedmonte province of Northern Italy. Gamba is the only Italian cooperage with representation in the U.S., manufacturing premium fermenters, casks, puncheons, and barrels.

Gamba sources tight-grain American, French, and Eastern European oak. Stave wood is aged in Asti, Italy, where regional climatic effects cause harsh tannins to be naturally removed during the 36-month seasoning process. The cooperage does not use a kiln to artificially expedite the chemical and physical changes that better occur naturally during maturation.

Barrels are heated and bent over open fire combining today's technology with Old World craftsmanship. Prior to shipment, barrels are cardboard protected and heat-shrink wrapped to prevent contamination during transit. Annual production is less than 10,000 barrels. The cooperage does not inventory barrels. Orders are customer-specified to common industry shapes and sizes from 110L to 600L.

During toasting, Gamba uses a ***Toast Check***™ infrared monitoring system to regulate toasting temperature and duration. Slow toasting has proven more homogeneous, reduces blistering, and promotes deeper penetration into staves. The result is a sweeter toast that softens the aromatic compounds.

Gamba cooperage is certified free of Brettanomyces, TBA, and TCA. Independent testing auditors provide ongoing random sampling of raw stave wood complying with certification to ensure the highest quality.

For more information, contact:
Gamba USA
PO Box 4364, Napa, CA 94558
tel: 707/696-9005; fax: 925/648-7558
e-mail: jeff@gambausa.com

Canton Cooperage

Canton Cooperage's premium, American oak wine barrels are made from extended air-dried white oak, cut in Canton's own stave mills. After selecting the best and oldest wood, the cooper blends the oaks to create a consistent product that customers worldwide have come to know and appreciate.

Today, Canton produces three high-quality American oak barrels that will meet any winemaker's needs.

Grand Cru — High-quality American oak specially selected for the tightest grain from the best forests and naturally seasoned for 36 months.

Vintage — High-quality American oak specially selected from the best forests and naturally seasoned for 24 months.

Classic — The best selection of American oak specially selected from the best forests and naturally seasoned for 18 months.

Canton Cooperage has been a part of Chene & Cie Company since 1998. Chene & Cie's holdings include: barrel producers Taransaud, Jacques Garnier, Canton Cooperage, Xtraoak, and Thales.

Whether the goal is consistency, complexity, or something truly bold and assertive, Canton has the products and expertise to meet the most exacting needs of today's winemakers.

For more information, contact:
Canton Cooperage
5793 Skylane Blvd. #B, Windsor, CA 95492
tel: 707/836-9742; fax: 707/836-9759
website: www.cantoncooperage.com

PLEASE SEE CANTON COOPERAGE AD, PAGE 40.

Critical Environment Technologies

Carbon Dioxide detection is an important part of winery workplace safety. People die every year from exposure to high concentrations of CO_2.

Installing a CO_2 detection system to monitor the concentration of CO_2 in the fermentation area and automatically activate ventilation equipment is an effective way to ensure the area is safe and to ensure compliance with workplace safety regulations such as OSHA.

Carbon Dioxide exists normally in air at concentrations between 300 and 600 ppm. Exposure to moderately higher concentrations may produce headache, sleepiness, or dizziness. Prolonged exposure to high concentrations of CO_2 can be fatal.

Carbon Dioxide is heavier than air and tends to accumulate near the floor. An injured person who has fallen to the floor could be exposed to dangerous levels of CO_2.

Critical Environment Technologies (CET) manufactures reliable, durable gas detection instruments for CO_2 and other gases including refrigerants, ammonia, carbon monoxide, SO_2, NO_2, chlorine, and many more. CET systems are very versatile and can be configured to suit any application, from smallest to largest.

For more information, contact:
Critical Environment Technologies
Bob Davidson
toll free: 877/940-8741
e-mail: marketing@cetci.com
website: www.critical-environment.com

Emmendinger Maschinenbau GmbH

Emmendinger Maschinenbau GmbH introduces theWK-12 machine for production of PVC and polylaminated capsules for wine bottles.

For several decades now, Emmendinger Maschinenbau (EMB), has done intensive investigation and development in close cooperation with customers. Besides production speed increases, the EMB research staff of designers, electrical engineers, and mechanical fitting engineers is doing its best to produce machines offering ease of operation.

EMB is currently showing, at the plant in Germany, the new high-performance WK-12 machine, which has been designed for production of PVC shrink capsules and polylaminated capsules. This machine can produce 250 capsules per minute of very high quality. EMB enjoys a lot of requests for factory showings of its new products, and receives many pre-orders for equipment under construction.

Other products include the small and less expensive WK-8 machine, with a production speed of 180 caps/min. of PVC and polylaminated capsules. The SK-12 machine can produce champagne capsules and, with an adaption kit, wine capsules using PVC, polylaminate, or aluminium foil.

For more information, contact:
Emmendinger Maschinenbau GmbH
Daniel Zibold
Am Elzdamm 32
D-79312 Emmendingen GERMANY
tel: 0049/ 7641 9242 69
fax: 0049/ 7641 9242 67
e-mail: info@emmendinger.de
website: www.emmendinger.de

Tonnellerie Quintessence

Traceability, consistency, and customization are the cornerstones of Tonnellerie Quintessence (TQ) Bordeaux . 100% of wood sourcing via the cooperage's own stave mills gives TQ direct access to premier forests. The cooperage is able to guarantee the tightness of the wood grain, the maturation period (Bureau Veritas certificate), and ensure consistency of supply.

When the wood is processed for barrel production, each lot is coded to record date of production, air-drying time, grain type, and wood origin.

After each barrel is in use in a cellar, a discrete barcode attached to each barrel allows TQ to provide the entire history from log to barrel. The cooperage uses eight quality control stations to measure the consistency of the production process. Each station follows strict standards for quality assurance. An intricate barcoding system with 10 variables outline necessary requirements to *customize* barrels for each client.

Tonnellerie Quintessence crafts a rare barrel that blends contemporary expertise, with the style expected of a French cooperage.

Tonnellerie Quintessence is pleased to announce that it is now the U.S. distributor for Heinrich Cooperage based in the Barossa Valley. The 225L barriques and 300L barrels are ideal for winemakers wanting to make Australian-style Shiraz.

For more information, contact:
Tonnellerie Quintessence
Brian Hartley, USA Sales Manager
PO Box 1851, Sonoma, CA 95476
tel: 707/935-3452; fax: 707/935-3422
e-mail: brian@tonnelleriequintessence.com
website: www.tonnelleriequintessence.com

PLEASE SEE TONNELLERIE QUINTESSENCE AD, PAGE 61.

ColloPack Solutions, LLC

ColloPack Solutions provides premier lines of processing and bottling equipment to the wine industry.

Manufacturers represented by ColloPack include:

- Diemme — membrane and screw presses; destemmer/crushers; grape sorting; and plate type lees filters.
- Bertolaso — integrated bottling lines including low-vacuum gravity and counter-pressure fillers; corkers; cappers for ROPP, crown, and plastic closures; bottle cleaners; micro-filtration systems; bottle conveyors and line automation.
- Robino & Galandrino — capsule dispensers; thermal heat-shrink capsule applicators for PVC; capsule spinners for composite and tin; wirehood and champagne capsule applicators.
- Cavagnino & Gatti — rotary wet-glue and pressure-sensitive labelers.
- Cames — bottle washing; and cork orientors.
- Berchi — bottle and carton palletizers/depalletizers; carton conveyors; and bottle casers/decasers.
- Perrier — sparkling wine disgorging machinery.
- Francisco Oller — sparkling and still-wine agglomerated closures.
- Tersainox — South America's premier stainless steel fabricator, stainless fermenting and storage tanks, portable tanks, stainless barrels with stainless or oak heads, sanitary stainless trench (grateless) drains.

COLLOPACK
SOLUTIONS LLC

ColloPack provides every customer with superior service and support and maintains a comprehensive local inventory of over 5,000 different parts.

For more information, contact:
ColloPack Solutions, LLC
Dave Means, Phil Giacalone, Rick White, Joe Mironicki, Mike Wlodarczyk, Greg Fulford
193 Camino Dorado, Napa, CA 94558
tel: 707/258-3940; fax: 707/258-3949
e-mail: sales@collopack.com

PLEASE SEE COLLOPACK'S AD, PAGE 27.

Pulsair Systems, Inc.

Pulsair is an innovative company that has brought a new technology to winemaking called Pneumatage — a new method for making wine! Pneumatage is changing the way people think about drinking wine, buying wine, and storing wine. Pneumatage makes better wine faster that is more drinkable sooner and therefore, no matter the arguments, better for the bottom line. Moreover, Pneumatage can be automated. It takes over where other systems are just starting.

Pulsair™
SYSTEMS, INC.

Pneumatage automates the fermentation cycle leaving the winemaker to do what they do best — make wine. The winemaker is now free to test, examine, evaluate, and taste the wine during fermentation and not worry about the daily chores of turnovers, labor management, and paperwork and, when the wine is finished, the data can be downloaded for future use.

The Pulsair hand-held PTM-2002W allows small wineries to turn the cap from the top or through the racking port. The portable Wine Cart expands the ability of the PTM to mix larger tanks in a semi-automatic mode. Pneumatage Light allows programming of a fermentation cycle. The fully programmable Pneumatage System will turn multiple tanks on a pre-determined time schedule for 14 days. More than 100 tanks can be operated from one central controller. When you're through, any Pulsair system can be used to quickly mix and blend to create a great Estate Vintage.

For more information, contact:
Pulsair Systems, Inc.
tel: 425/455-1263, or toll free: 800/582-7797
e-mail: sales @pulsair.com

PLEASE SEE PULSAIR SYSTEMS' AD, PAGE 86.

Barrel Builders

Barrel Builders, exclusive distributor of **Tonnellerie Marchive** barrels from France, **Budapesti Kadar** barrels from Hungary, and **EBC** barrels from Kentucky, is also the exclusive supplier of ProxyClean™, a non chlorine-based cleaner for use throughout the winery. Barrel Builders offers a range of silicone bungs in solid, EasyGrip, and FermRite styles. Other products include oak chips, inserts, cooperage repair, and maintenance items.

Located in Cognac, France, **Tonnellerie Marchive** was an early pioneer of the long, slow toasting process. Using woods sourced from the leading forests of France, the cooperage produces a full range of Burgundy, Bordeaux, and 265L barrels. Presently, Barrel Builders offers Bordeaux-style (Pennsylvania oak) barrels coopered by Tonnellerie Marchive.

Budapesti Kadar was first introduced into the U.S. in 1993. Oak for their Burgundy, Bordeaux, and 265L barrels is sourced exclusively from the Zemplen forest in Tokai and is similar in texture and flavor to the oaks of central France. The entire 2004 production for the U.S. market was allocated by June.

American oak barrels are coopered by **East Bernstadt Cooperage** from three-year seasoned Kentucky wood. A Bordeaux-style barrel is offered in a range of toast levels.

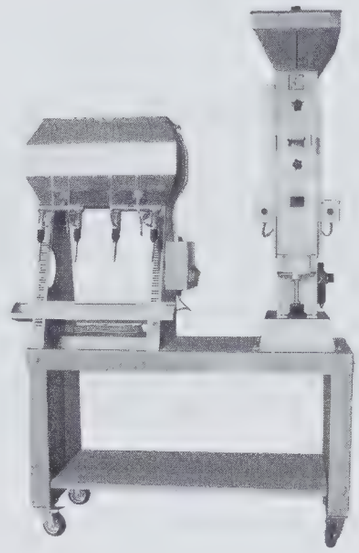
Barrel Builders' full-service shop offers barrel reconditioning, repairs, insert system installation, small barrels, and custom-size barrels.

For more information, contact:
Barrel Builders
1194 Maple Ln., Calistoga, CA 94515
tel: 707/942-4291; fax: 707/942-5426
e-mail: barrel@napanet.net
website: www.barrelbuilders.com

PLEASE SEE BARREL BUILDER'S AD, PAGE 77.

Napa Fermentation Supplies

Napa Fermentation Supplies offers a full line of winemaking equipment and supplies, including stainless steel tanks in variable capacity with adjustable lids from 26 gallons to 1,321 gallons and closed-top tanks from 79 gallons to 3,963 gallons, with or without manway.



Also available are: Karcher hot water pressure washers with 1,300 psi to 3,000 psi and temperatures from 86°F to 285°F steam; one-inch and 1.5-inch Jabsco pumps with AC inverter drive; two-inch or three-inch Zambelli must pumps with AC inverter drive; Zambelli crusher/destemmers from two to 10 tons per hour; Zambelli manual and hydraulic presses; eight-inch Zambelli plate filters; a full line of stainless steel fittings and valves, butterfly and ball; one-inch to four-inch wine hose; labware; refractometers; wine thieves; and table-top labelers.

Napa Fermentation also offers the "Tivoli" portable filling/corking machines with an hourly production rate of 500 to 600 liters per hour. The machine is pneumatic, manufactured in AISI 302 stainless, and only weighs 72 KG. The Tivoli takes 22mm, 24mm, 26mm natural or synthetic corks, and can be fitted for 28mm on request.

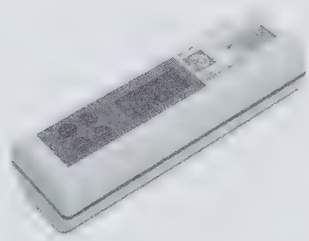
For more information, contact:
Napa Fermentation Supplies
575 Third St., Bldg. A, Napa, CA 94559
tel: 707/255-6372; fax: 707/255-6462

PLEASE SEE NAPA FERMENTATION'S AD, PAGE 56.

Bellingham + Stanley, Inc.

Bellingham + Stanley offer a wide range of refractometers for use in the wine, fruit, and beverage industries. The portable Eclipse and DR handheld range of refractometers can achieve a wide variety of %Brix, probable Alcohol, Oechsle, KMW (Babo), and many other scales for "on-the-spot" measurements in the field or laboratory, to the RFM700, RFM800, and RFM300 automatic digital bench ranges for higher accuracy across extended %Brix ranges. Taking the concentration %Brix reading of grapes to monitor ripeness could not be easier.

Bellingham + Stanley is situated near Atlanta, GA, and offers full sales and service of their high quality products and technical expertise in back up and support. Bellingham + Stanley's facility can assist with loaners and demonstration models so you can maintain your production and harvest without loosing out on the valuable results desired by the industry when your unit needs to be serviced or you are looking to upgrade.



Fully comprehensive literature, information, and pricing details are available by contacting Bellingham + Stanley by phone, fax, or email.

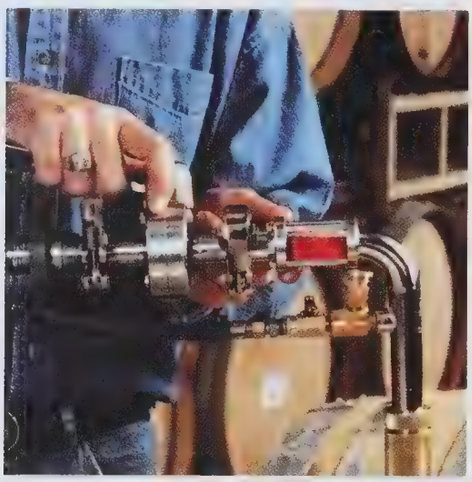
For more information, contact:
Bellingham + Stanley, Inc.
1000 Hurricane Shoals Rd., Bldg. D, Ste. 300
Lawrenceville, GA 30043
tel: 800/678-8573; fax: 770/822-9165
e-mail: techsales@bs-rfm-inc.com
website: www.bellinghamandstanley.com

PLEASE SEE BELLINGHAM + STANLEY AD, PAGE 52.

Bulldog Manufacturing

Transferring wine with the Bulldog Pup gas-pressure racking wand allows easily-controlled gentle flow without agitation or oxidation. This convenient tool is indispensable for achieving extremely clean rackings. The Pup has become a valuable racking device for the cellar. The "Pup" racking process is often referred to as "Bulldoggin'" throughout the industry.

The Pup and attachments are constructed using top-quality material and craftsmanship. The Pup is very durable and has a sanitary design that is easily cleaned. The wand has nine inches of vertical height adjustment and can be locked in place at a desired height. An expanding silicone bung seals the wand in the barrel without damage and prevents gas leakage.



Bulldog Pup gas-pressure racking wand

Optional attachments are available to add to the versatility of the Pup:

- The **Foot Valve** is a check ball valve for the wine inlet to prevent wine from siphoning out when removing the wand from a barrel.
- The **Flex Leg** allows insertion into barrels with limited access.
- The new **Top Dog** secures the Pup in beer kegs for topping or racking.

"Don't settle for a mutt!"

For more information, contact:
Bulldog Manufacturing
PO Box 356, San Luis Obispo, CA 93406
tel: 805/541-3083; fax: 805/544-6181
e-mail: pups@bulldogmfg.com
website: www.bulldogmfg.com

PLEASE SEE BULLDOG MANUFACTURING AD, PAGE 132.

Mercier USA, Inc.

Tonnellerie Mercier has achieved all the necessary changes after Frederic Mercier took over the small family cooperage. New buildings and modern machinery are dedicated to excellence and continuity of production.

From the forest selection to your cellar, quality control is a priority. Each barrel is coded to certify wood, air-drying time, and all manufacturing details.

Master cooper Frederic Mercier uses oak obtained exclusively from French forests proven to be consistent, continuous sources of premium oak. Barrels include: 225L export Bordeaux, 225L export Bordeaux thin stave (22mm), 225L Tradition Bordeaux/Burgundy, 225L Chateau Bordeaux Ferre, 228L Burgundy, and 500L puncheon.

Tonnellerie Mercier's team of experienced winemakers follow up by tasting and coordinating with clients around the wine world and provide experience and knowledgeable help to tune-up and respect your choices.

Troncais oak, aged for 36 months, is available for your finest red wines. Before your next order, call Tonnellerie Mercier, who will help you, glass in hand, in the cellar.

For more information, contact:
Mercier USA, Inc.
Krimo Souilah
2164 Monticello Rd., Napa, CA 94558
tel: 707/251-5818; fax: 707/251-5811
e-mail: mercierusa@aol.com
website: www.mercierusa.com

PLEASE SEE MERCIER USA'S AD, PAGE 7.

Toyota Material Handling

Toyota Material Handling Northern California, the largest Toyota lift truck supplier West of the Mississippi, introduces the 4,500 lb. capacity Electric Pallet Truck. This technologically advanced, highly maneuverable pallet truck features a compact design for improved efficiency in confined spaces.

Ideal for applications as varied as warehouse environments, retail stores, wineries and transportation operations, Toyota's new Electric Pallet Truck is a versatile, reliable and cost-effective material handling solution. It performs exceptionally well in confined or congested locations, such as trailers, improving spatial use and productivity.

Advanced engineering features are at the heart of the Electric Pallet Truck's outstanding performance. The SepEx™ (separately excited) drive motor and transistor control system combine to deliver excellent acceleration, top speeds and smooth speed control, which is essential for precise truck positioning and accuracy. Its "pinwheel" capability allows for right angle stacking inside trailers and other confined areas.

As with all Toyota industrial equipment, comfort and convenience are a priority. Operators will appreciate the multifunction control handle with large, ergonomically positioned buttons and dual thumb wheels for easy activation of all controls with either hand.

For more information, contact:
Toyota Material Handling
Mark Andres
tel: 800/527-3746
e-mail: info@tmhnc.com
website: www.tmhnc.com

PLEASE SEE TOYOTA MATERIAL HANDLING AD, PAGE 85.

Refrigeration Technology, Inc.

Refrigeration Technology, Inc. (RTI) builds portable glycol chillers with optional heating in three sizes (2hp, 3hp, and 5hp) for small wineries.

RTI Construction is a new division that sells and installs STAR™ metal buildings for production and storage buildings.

RTI has a 20,000 sq. ft. facility in Middletown, CA, which is the company's world headquarters. 7,200 sq.ft. has been bonded for temperature-controlled, case-goods wine storage (competitively priced), ideal for long-term storage of small lots. The warehouse is designed to maintain 58° to 60°F year-round and is equipped with temperature and security alarms.

The cost of RTI's SUPER STAT control systems has been reduced. They are now PC-compatible and feature new graph- and data-download options. RTI can put customer's control systems on the web for worldwide access by authorized personnel.

For more information, contact:
Refrigeration Technology, Inc.
18815 S. Hwy. 29, PO Box 368
Middletown, CA 95461
tel: 800/834-2232 (toll free) or 707/987-0500
fax: 707/987-4581
e-mail: sales@rti2000.com
website: www.rti2000.com

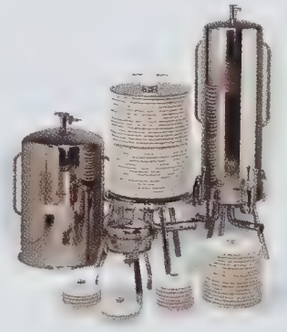
PLEASE SEE RTI'S AD, PAGE 77.

CUNO Filter Systems

CUNO is a world leader in the design, manufacturing, and marketing of a comprehensive line of filtration products and systems for the separation, clarification, and final filtration of fine wine.

The long list of innovative products for wine filtration offered by CUNO includes the first non-asbestos filter sheet (Zeta Plus®), long-lasting membrane filters optimized for repetitive hot-water exposure (BevASSURE® II), and the first multi-zone membrane prefilter (LifeASSURE®).

CUNO's latest advancement is the introduction of the Zeta Plus Maximizer™ line of depth filter cartridges for wine clarification. CUNO created the original ZETA Plus cartridge concept to address the many drawbacks of conventional sheet filtration, including wine leakage, labor costs, and high running costs. Zeta Plus cartridges are installed in a completely enclosed, sanitary filter housing that eliminates wine loss and requires as little as 15 minutes to change filters.



The new Maximizer version of Zeta Plus incorporates a dual-layer media design offering built-in prefiltration for difficult-to-filter wines, dramatically extending filter service life.

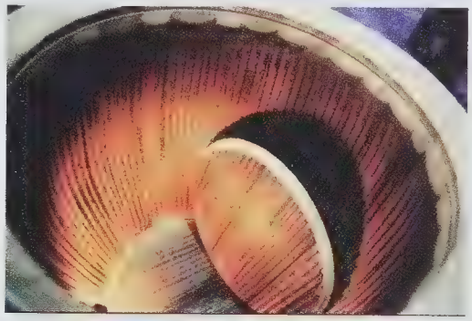
With over 90 years of experience and manufacturing facilities on five continents providing easy access to all major wine-producing regions, CUNO is uniquely positioned to serve wineries worldwide.

For more information, contact:
CUNO Filter Systems
400 Research Parkway, Meriden, CT 06450
tel: 800/243-6894; fax: 203/630-4530
e-mail: cohara@cuno.com
website: www.cuno.com

Seguin Moreau Napa Cooperage, Inc.

The taste of an exquisite wine is the result of a marriage of flavors between the grapes and the barrels that hold the wine during the ageing process.

Seguin Moreau's commitment to quality and consistency is a benchmark for the wine industry. This may explain why Seguin Moreau barrels are in winery cellars around the world. Seguin Moreau's dedication to innovation and research has resulted in a vast product line in American, French, Russian, and European oaks.



Seguin Moreau is the only French cooper that buys 100% *haute futaie* (government-managed forests) for its French oak barrels. Its U-stave barrel is growing in popularity and is exclusive to Seguin Moreau. Available in American oak, this barrel provides a greater depth of toast, enhancing a wine with depth and elegance, providing a sweet, rich palate.

Seguin Moreau's proprietary Référence and Russian oak barrels were developed to add the same characteristics as French oak, offering clients another source of *Quercus Sessilis*, thus meeting the growing demand for quality oak. Seguin Moreau offers a barrel for every winemaking program.

Seguin Moreau blends prestigious French tradition, American resources, and dedication to clients to help make the best wines possible.

For more information, contact:
Seguin Moreau Napa Cooperage, Inc.
151 Camino Dorado, Napa, CA 94558
tel: 707/252-3408; fax:707/252-0319
e-mail: jforster@seguinmoreau.com
website: www.seguinmoreaunapa.com

PLEASE SEE SEGUIN MOREAU'S AD, PAGE 31.

Tonnellerie Bordelaise

Tonnellerie Bordelaise offers barrels of unique quality to wineries thanks to the extensive experience of its barrel-producing partners.

The company combines wood sourcing and milling by Scierie Delord (a third-generation wood mill business headed by Patrick Delord) with barrel-making by master cooper Didier Fesil, whose career experience includes master cooper responsibilities at Sylvain and Chateau Smith Haut Lafitte in Pessac-Leognan, France.

This partnership allows Tonnellerie Bordelaise to trace and control every piece of wood, from specific forest source to finished barrel. All Bordeaux- and Burgundy-style barrels are made using the finest-grained sessile oak sourced only in oak forests of central France.

Prior to being fashioned into staves at the tonnellerie, selected shooks are moisture-controlled and air-dried for 24 to 36 months in outdoor yards at Scierie Delord to ensure optimal seasoning of the wood.

Each order is custom-made to meet each customer's specifications. Master cooper Fesil personally oversees all barrel toasting, fabrication, and finishing in Tonnellerie Bordelaise's artisan workshop and inspects every barrel to assure quality.

Tonnellerie Bordelaise strongly believes in working closely with winery customers to anticipate their needs and help achieve the goal of creating elegant, fine wines.

For more information, contact:
Tonnellerie Bordelaise
Oliver E. Wood, Jr. sole agent
25227 Hatton Rd., Carmel, CA 93923
tel: 831/625-0304; fax: 831/625-0305
e-mail: owood@tonnellerie bordelaise.com
website: www.tonnellerie-bordelaise.com

PLEASE SEE TONNELLERIE BORDELAISE AD, PAGE 73.

Raynox 2000, Inc.

Raynox 2000, Inc., manufactures custom-fabricated stainless steel tanks and equipment for small and medium-size wineries.

Stationary, insulated, stainless steel tanks built by Raynox for maceration, fermentation, and storage are available with floating or closed tops and cooling or heating jackets. Comparable to the best European tanks with high standards for welding and polishing, the tanks are sold throughout Canada and the U.S. Raynox has developed in-house equipment to reproduce the swirl pattern of the European finish at an excellent price.

Raynox fabricates custom accessories, such as draining cages, cap punchers, cooling plates, decanters, oak chip containers, and more.

Stackable, stainless steel barrels are available for storage use or as fermenter barrels. All products are made to the customer's specific requirements.

Small and medium-size wineries have space constraints. Because Raynox is the manufacturer, it can modify tanks, products, and equipment to a winery's requirements, helping to maximize winemaking capacity.

For more information, contact:
Raynox 2000, Inc.
Sales Department
1148 St. Michel, St. Cesaire
Quebec, Canada J0L 1T0
tel: 866/469-4181 (toll free)
fax: 450/469-2112
e-mail: raynox@raynoxinc.com
website: www.raynoxinc.com

PLEASE SEE RAYNOX'S AD, PAGE 16.

Winesecrets

In 2004, Winesecrets introduced a "better mousetrap for tartrates." In 2005, Winesecrets introduces membranes for STARS that reduce wine pH!

The STARS (selective tartrate removal system) pH-adjustment module uses bi-polar electrodialysis (BPED) to remove potassium ions from wine with selectively permeable membranes. Potassium is replaced with protons from electrolysis of water in the bipolar membrane. The process is controlled through the change in pH resulting from the additional protons. Winesecrets can reduce the pH of wine by 0.5 pH units per pass, and can reduce the pH of juice by 1.0 pH units per pass.

STARS is used for tartrate stabilization. Benefits include:
1. Energy saving (cold stabilization) or waste reduction (ion exchange),
2. Conservation of wine volume, flavor, and aroma through selective action,
3. Predictable production rates,
4. Reliable stability from continuous, in-line conductivity monitoring.

Winesecrets mobile winemaking services include:
1. Stabilization with STARS,
2. Clarification with cross-flow filtration,
3. Removal of VA and other taints from wine with reverse osmosis filtration,
4. pH reduction with STARS pH adjustment module

Winesecrets is positioned to serve all of North America's winemaking regions, with operations in California, the Northwest, and Northeast.

For more information, contact:
Winesecrets
101 S Coombs St., Ste. F, Napa, CA 94559
tel: 707/255-9107; fax: 707/255-9167
website: www.winesecrets.com

Pickering Winery Supply

Pickering Winery Supply offers French oak, Eastern European oak, and American oak barrels from three coopers, and Modern Stainless & Design stainless steel tanks.

Tonnellerie Vernou's success has been earned by controlling barrel crafting from the "grumes" to finished barrels, producing consistent barrels. In addition to familiar forest offerings, customers can specify "Burgundy Blend" barrels with long toasts, "waterbent" for Sauvignon Blanc, or the hybrid AOFO barrel, which captures the best of American oak staves and French oak toasted heads. Vernou also produces small barrels from 20 liters and tanks up to 1300 gallons.

Tonnellerie Meyrieux toasts barrels over small braziers for 1.5 hours to achieve a distinctive, smoky, fruit-driven barrel ideal for Burgundy varietals and Syrah. Now offering 3-year air-dried wood, production is very limited from this tiny but highly regarded Burgundian cooper.

Tonnellerie Doreau barrels are made from only the tightest-grain wood. The barrels' initial success has been with long-aging Bordeaux red wines. However, the barrels' elegance and slow extractability have proven ideal for Chardonnay, Italian reds, or any wines that require an oak backbone for high-quality fruit.

Modern Stainless & Design (MSD) manufactures some of the finest tanks available, with high-grade finishes, and tank stands built to zone-four-spec standards. The latest technology is used to increase production and control costs. As a result, MSD has become a large lank producer for California wineries. MSD has its own trucks and cranes to offer greater value to the customer.

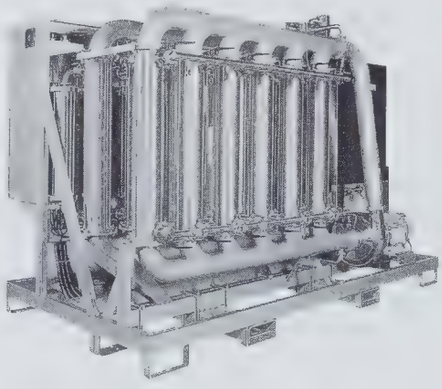
For more information, contact:
Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617
e-mail: pickering@sbcglobal.net
website: www.winerystuff.com

PLEASE SEE PICKERING'S AD, PAGE 68.

Gusmer Enterprises

Gusmer Enterprises' collaboration with Vaslin-Bucher offers the next generation of cross-flow filters to the U.S. wine industry. Vaslin-Bucher has engineered a fully automated cross-flow filtration system that will clarify wines and prepare them for sterile filtration, all in one-step.

The Vaslin-Bucher FM filter fully respects the quality of your wines! It utilizes a low filtration pressure (1.2 bar), kept at a constant level via a positive displacement feed pump, and operates with essentially no increase in temperature (5°F maximum). Backpulse technology optimizes the flow rate, and there is no spent filter media to dispose of. The FM filter is easy to use and is capable of operating around the clock without direct operator supervision. There is an FM filter appropriately sized for all size wineries.



Evaluate a Vaslin-Bucher FM filter at your facility with the FM40 demonstration unit. This fully automated 40 square meter filter is trailer-mounted and can be brought to your winery for a production trial. Contact your Gusmer Enterprises representative for details.

For more information, contact:
Gusmer Enterprises
Don Krull, Shadow Ostowari, Bill Merz, Ken Stewart, Dave Gusmer, Kathy Bollock, Rodger Pachelbel
81 "M" St., Fresno, CA 93721
tel: 559/485-2692; 559/485-4254
e-mail: sales@gusmercellulo.com
website: www.gusmercellulo.com

PLEASE SEE GUSMER ENTERPRISES' AD, PAGE 63.

Valley Pipe & Supply, Inc.

Valley Pipe & Supply, Inc., currently in its 65th year in business, has headquarters in Fresno, CA, a branch office in Napa, CA, and sales offices in Sonora, Mexico, and Niagara on the Lake (Canada). Valley Pipe & Supply was founded in 1940 as a supplier to food processing, chemical, industrial, and OEM manufacturing plants in the San Joaquin Valley and began importing and manufacturing equipment for the wine and beverage industries throughout the U.S., Mexico, and Canada in the late 1980s.

To be of more service to its customers, Valley Pipe & Supply has a full-time technician trained at several of the overseas factories whose machinery Valley Pipe & Supply represents.

Valley Pipe & Supply Inc. represents the following brands, just to name a few: Defranceschi membrane presses; automatic punchdown tanks; the "Puntarossa" automatic punchdown and pumpover combination tank; Amos and Milani destemmers; Spadoni filters; Enopompe piston pumps; BCM flexible impeller pumps; Acrolon Technology TankNet controls; and other winery pumps and industrial supplies.

Banding of the new Valley Pipe & Supply "Cuvee" rubber hose and several styles of PVC hose is done at the Fresno and Napa locations. Fabrication of stainless hoppers, dumps, conveyors, three-way must valves, Valley Pipe & Supply pumps, and PCT fittings is done in Fresno.

Valley Pipe & Supply would like to thank the wine industry for your patronage and support and looks forward to serving you in the future.

For more information, contact:
Valley Pipe & Supply, Inc.
1801 Santa Clara, Fresno, CA 93721
tel: 559/233-0321; fax: 559/233-1713
e-mail: valleypipesupply@aol.com
Napa Showroom
110 Camino Oruga, Napa, CA 94558
tel: 707/226-6427; fax: 707/226-7593
East Coast/Canada tel: 905/468-3719
fax: 905/468-3048
Mexico tel: 637-37-273-82

PLEASE SEE VALLEY PIPE & SUPPLY AD, PAGE 71.

Demptos Napa Cooperage

You don't have to be an enological Rip Van Winkle to have missed the dramatic developments at Demptos! During 13 years of Francois family ownership, the Bordeaux cooperage was modernized and new cooperages were constructed in Napa, CA, Szigetvar, Hungary, and Logrono, Spain. Demptos Cooperages uses its oak selections to produce world-class French, American, and Hungarian oak barrels for some of the world's finest wines.

Demptos selects tight-grain American white oak from heavy clay and gravel soils within a 50-square-mile area in southern Missouri. Following natural seasoning for 27-36 months, the staves and headwood are sweet and ready for coopering into 228L Burgundy and 225L Bordeaux Export style barrels. Traditional oak-fire bending and toasting (minimum of 50 minutes) allow complete development of toasty, sweet oak flavors in the finished barrels.

Backed by the Demptos research department, Demptos coopers French and Hungarian oak barrels in Burgundy and Bordeaux styles and custom oak tanks. 10 forest selections and 12 barrel styles promise the best barrels to complement your wine.

Visit Demptos Napa Cooperage for a complete tour and barrel seminar. The staff, including Mark Heinemann, Coby Jamieson, Tom Payette, and Will Jamieson, looks forward to working with you in 2005!

For more information, contact:
Demptos Napa Cooperage
1050 Soscol Ferry Rd., Napa, CA 94558
tel: 707/257-2628; fax: 707/257-1622
e-mail: info@demptosusa.com
website: www.demptosusa.com

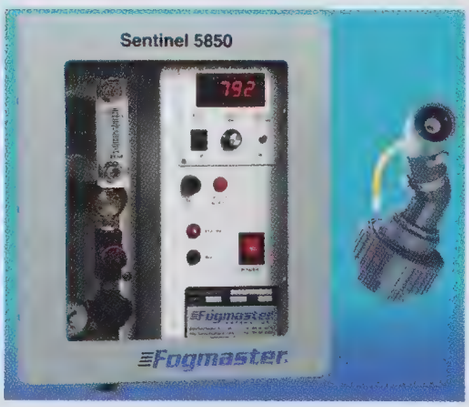
PLEASE SEE DEMPTOS' AD, PAGE 84.

Fogmaster Corporation

Fogmaster's new Sentinel-5850 barrel-room humidification system brings innovative atomization technology to small- and mid-size wineries. It uses a turbulent-vortex nozzle to atomize water into micro-droplets that evaporate quickly and spread uniformly throughout the barrel room.

The control unit (pictured) monitors relative humidity and regulates water flow. A regenerative blower, designed for efficiency and low-maintenance cost, provides air to atomize water.

When humidity drops below the set point, the control unit activates the system and the nozzle ejects a fog of tiny droplets. The droplets evaporate quickly and raise humidity so barrels stay dry. Because the nozzle has no tiny orifices, nozzle plugging is not an issue.



Designed for "do-it-yourself" installation, the Sentinel-5850 includes all installation components except the two-inch PVC pipe needed to convey air from the blower to the nozzle.

A single nozzle system can maintain a 5,000-sq.ft. barrel room. A cart option is available for users requiring mobility.

For more information, contact:
The Fogmaster Corporation
1051 SW 30th Ave.
Deerfield Beach, FL 33442
tel: 954/481-9975; fax: 954/480-8563
e-mail: info@fogmaster.com

PLEASE SEE THE FOGMASTER AD, PAGE 44.

Stokes Ladders, Inc.

A leading manufacturer of aluminum orchard ladders for more than 40 years, Stokes Ladders, Inc. offers quality rolling barrel-room ladders specifically designed to fit in narrow aisles between stacks of wine barrels. Now used in over 60 West Coast wineries, these ladders provide workers safe access to barrels without having to climb racks, and eliminate having to lower barrels with a forklift to be inspected or topped.

Ladders can accommodate stacks up to six barrels high. The height of the ladder, combined with a narrow 18-inch width, allow for maximum barrel count in a barrel room.

The ladders are constructed of high-strength, light-weight structural aluminum, and feature four heavy-duty, non-marking locking casters, a roomy 16-inch x 24-inch top platform with handrails and toe boards, 7½-inch deep steps, and a comfortable 60-degree climbing angle. Options include a back ladder and different base configurations. Because of the narrow base, these ladders must only be used in the narrow confines of barrel aisles. Custom ladders are available.

For more information, contact:
Stokes Ladders, Inc.
PO Box 445, Kelseyville, CA 95451
tel: 707/279-4306, or 800/842-7775
fax: 707/279-2232
e-mail: info@stokesladders.com
website: www.stokesladders.com

Woodlands Trading Co., Inc.

Woodlands Trading Company, Inc., offers top-quality French, Eastern-European, and American oak barrels to the western U.S. wine industry. Woodlands is a member of the Associated Cooperage Industries of America (ACIA) and is a leading supplier of the finest oak staves for fabrication of barrels in Europe.

All Woodlands barrels are coopered in Spain utilizing the skills of family-owned cooperages with several generations of experience. Experience, coupled with unmatched attention to wood selection, make Woodlands' barrels as unique as the country in which they are crafted.

Woodlands oversees the quality of its products beginning when the rough staves are sawn. From there, the staves travel to Andalucía for seasoning in the incomparable climate of southern Spain. After the staves are seasoned for a period of no less than two years, they are fashioned into some of the finest barrels available on the market today — and at a reasonable price.

Try Woodlands French, European, or American oak barrels today, and give your wine the profile it deserves.

For more information, contact:
Woodlands Trading Co., Inc.
210 Castle Dr., West Mifflin, PA 15122
tel: 412/466-8264; fax: 412/466-2224
e-mail: woodlandstc@yahoo.com

PLEASE SEE WOODLANDS' AD, PAGE 90.

Paul Mueller Company

Established in 1940, Paul Mueller Company is a leading manufacturer of high-quality stainless steel tanks and processing equipment that make the customer's process smoother, faster, and more reliable.

Mueller has the technical expertise, innovative engineering, and manufacturing resources to implement a process system specific to your needs. Mueller's philosophy is simple: They are committed to meeting and exceeding customer's expectations of value by providing quality equipment and excellent service.

MUELLER®
PROCESSING SYSTEMS AND EQUIPMENT

Mueller has more than 950,000 square feet of manufacturing space in two facilities located in Springfield, Missouri, and Osceola, Iowa. Mueller products are used in over 100 countries worldwide.

Field fabrication, erection, and installation services are provided by Mueller Field Operations, Inc., a wholly owned subsidiary. Transportation is handled by another wholly owned subsidiary, Mueller Transportation, Inc.

For more information, contact:
Paul Mueller Company
PO Box 828, 1600 West Phelps
Springfield, MO 65801-0828
toll free: 800/MUELLER
website: www.muel.com

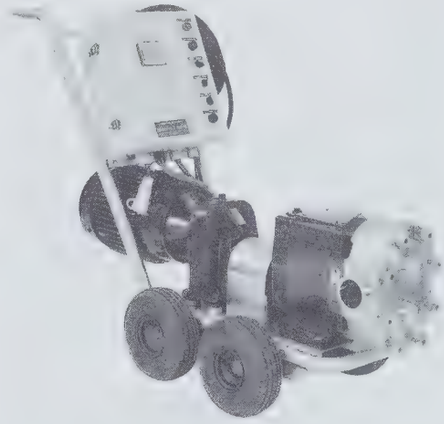
PLEASE SEE PAUL MUELLER CO. AD, PAGE 69.

Carlsen & Associates

Carlsen & Associates designs, manufactures and represents equipment for many aspects of the wine industry including:

- Receiving hoppers,
- Waukesha must pump systems,
- Puleo destemmers/crushers,
- Waukesha centrifugal pumps,
- Puleo open-screen membrane presses and closed tank presses,
- Yamada air pumps,
- Pump-over sumps,
- Ozone sanitation systems,
- Fittings and valves.

Carlsen & Associates produces quality products and services that provide simple solutions to your needs.

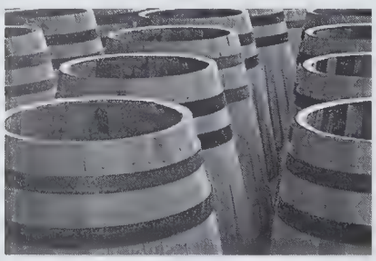


For more information, contact:
Carlsen & Associates
1439 Grove Street, Healdsburg, CA 95448
tel: 707/431-2000; fax: 707/431-2005
website: www.carlsenassociates.com

PLEASE SEE CARLSEN & ASSOCIATES AD, PAGE 43.

Artisan Barrels

Jérôme Aubin of Artisan Barrels is the exclusive U.S. representative of Tonnellerie Rousseau in Burgundy, Tonnellerie Saint Martin in Bordeaux, and a distributor for Tonnellerie Allary in Cognac (puncheons and small barrels).



Tonnellerie Saint Martin, a Family cooperage in Bordeaux, selects the finest staves available from ancient forests in Allier, Vosges, Troncais, Jupilles. Western U.S. wineries may order 225L Bordeaux Transport, Ferré or Tradition (22 and 27mm thick staves), and Grande Reserve (three years air-dried). In 2005, Saint-Martin will craft 225L, 350L, and 500L modified barrels with a stainless steel door to put grapes directly into barrels, enabling winemakers to reduce handling by using the same barrels for fermentation and maturation.

Tonnellerie Rousseau, in Burgundy, is a medium-size cooperage producing Burgundy-style barrels (228L Transport and Tradition). Single forest or blended French oak staves are air-dried for 24 to 36 months. Rousseau has earned a solid reputation for custom ovals, casks, and upright fermenters, a cost-effective way for winemakers to ferment and age wine with less oak impact and more minerality and textural softness.

Tonnellerie Allary, an award-winning cooper in Cognac, specializes in coopering puncheons (500L French and U.S. oak) and small wine and vinegar barrels available to purchase online.

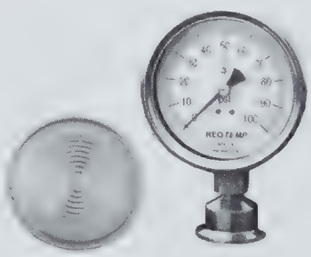
For more information, contact:
Artisan Barrels
Jérôme Aubin
6050 Colton Blvd., Oakland, Ca 94611
tel: 510/339-0170, mobile: 510/708-2290
fax: 510/339-0173
e-mail: jerome@artisanbarrels.com
website: www.artisanbarrels.com

PLEASE SEE ARTISAN BARRELS' ADS, PAGES 44 AND 74.

REO*TEMP* Instrument Corp.

REO*TEMP* is an ISO 9001 manufacturer of temperature and pressure instrumentation. Established in 1965, **REO*TEMP*** offers a diverse line of industrial and sanitary instruments: bimetal thermometers, thermowells, pressure and temperature switches, pressure gauges, diaphragm seals, pressure transmitters, remote reading thermometers, RTD's and thermocouples, and digital thermometers.

REO*TEMP* has facilities to mount and calibrate pressure gauges, switches, and transmitters to most diaphragm seal configurations. Remote capillary, heat compensation, and instrument tee assemblies are available. **REO*TEMP*** also offers a variety of niche temperature products for the compost, waste management, and recycling markets.



REO*TEMP* Instrument has a compete line of clean-in-place sanitary pressure and temperature instrumentation for the wine industry. **REO*TEMP***'s CIP sanitary product line consists of sanitary RTD and thermocouple assemblies, pressure gauges, bimetal thermometers, in-line diaphragm seals, and pressure transmitters. All products are equipped with a sanitary connection and designed to meet 3A quality standards.

For more information, contact:
REO*TEMP* Instruments Corporation
10656 Roselle St., San Diego, CA 92121
tel: 800/648-7737 (toll free), or 858/784-0710
fax: 858/784/0720
e-mail: reotemp@reotemp.com
website: www.reotemp.com

PLEASE SEE REOTEMP INSTRUMENT'S AD, PAGE 68.

Hoover Materials Handling Group

Hoover Materials Handling Group, Inc. has the answer for your wine storage during peak production times. Stainless steel wine tanks are manufactured in an ISO 9001:9002 facility to meet the high-quality standards of the wine industry. Tanks are ideal for fermenting Sauvignon Blanc and other white wines, or for temporary storage for red wines.

Hoover has been manufacturing containers since 1949, and has withstood the test of time. Hoover's flexible procurement options include an attractive rental program.

Tank sizes available are 180, 250, 350, 450, or 550 gallons.

The wine tank features:
- 304 stainless steel (10-gauge) construction,
- 22½-inch top opening,
- 2-inch sanitary 90-degree elbow in tank bottom for discharge.

Numerous options are available, including a 304 stainless steel (14-gauge) heating and cooling transfer surface.

Hoover Materials Handling Group, Inc. also offers the Endural grape box, which is excellent for grape picking. This FDA-approved, natural HDPE container is easy to handle, durable, reusable, and features an easy to clean, smooth surface.

For more information, contact:
Hoover Materials Handling Group, Inc.
8801 Wallisville Rd, Ste. A
Houston, TX 77029
tel: 800/324-8683; fax: 713/678-7077
website: www.hooversolutions.com

PLEASE SEE HOOVER MATERIALS HANDLING GROUP AD, PAGE 89.

Tonnellerie Boutes

Boutes has been a family tradition for over 120 years. Family-owned and operated by Henri Barthe and his two sons, Eric and Pierre, Tonnellerie Boutes is located in the heart of the Bordeaux region of France.

Through the Office Nationale des Forêts, Boutes self-sources 75% of its stave grade standing trees from the best forests in France. For over 10 years, this has made Boutes the leading purchaser of standing trees in the Department of Allier. Purchasing by this method would not be possible without the skill, experience, and knowledge of Boute's foresters who annually assess the wood available for purchase.

Unique to Boutes is the *stave immersion* process that prepares and controls the refining of the oak tannins. This, along with exclusive use of the finest oak woods and the knowledge of its master coopers, allows Boutes to offer a unique blend of *innovation*, *tradition*, and *art* in crafting barrels that achieve perfect harmony between wine and the barrel.

Barrel sizes available are: 225L, 228L, 265L, 300L,and 500L.

For more information, contact:
Tonnellerie Boutes
Manny Martinez
tel: 510/799-1518; fax: 510/799-1557
e-mail: boutesusa@aol.com
website: www.boutes.com

PLEASE SEE TONNELLERIE BOUTES AD, PAGE 46.

TCW Equipment (The Compleat Winemaker)

TCW Equipment is the exclusive distributor for world-renowned manufacturers of premium equipment such as the world's gentlest pumps from Ragazzini in Italy, and Mori and Mencarelli pumps; HYPAC and Mori traditional basket presses, and lateral and central membrane presses by ATI and Miros. Large and small winery customers have successfully utilized TCW's products since 1966.

PUMPS — New line of gentle pumps: Low RPM (30 to 210 GPM) with gentle operation, 1.5-inch to 3-inch diameter. A new 30 GPM, 6-inch diameter peristaltic pump from Ragazzini. For more than 60 years, Ragazzini has manufactured high-quality peristaltic and piston pumps.

PRESSES — A new model basket press from HYPAC — an automatic operation 455-gallon stainless steel basket press for high-end wine pressing. Mori electric-hydraulic presses come in slightly smaller capacity. ATI and Miros diaphragm presses are open or closed tank, with lateral or central membranes, from 8 to 360 hectoliters (210 to 9,500 gallons) capacity.

BOTTLING and SCREW-CAPPING — New line of monobloc and single operation equipment for rinsing, filling, screw capping, and labeling.

For more information, contact:
TCW Equipment
(The Compleat Winemaker)
955 Vintage Ave., St. Helena, CA 94574
tel: 707/963-9681; fax 707/963-7739
website: www.tcw-web.com

PLEASE SEE TCW EQUIPMENT (COMPLEAT WINEMAKER) AD, PAGE 133.

Jaybird Manufacturing, Inc.

Jaybird manufactures a commercial line of fine-mist fogging units, perfectly suited for wine storage humidification. With three major product lines to choose from, Jaybird has units to suit any size barrel room.

From durable mobile floor units to hanging fan units, Jaybird brings all the advantages of high-tech fogging down to simple stand-alone independent units. Enormously powerful and attractively priced, Aquafog® humidifying fans do not require high-pressure pumps or massive air supplies for operation. The nozzle-free units connect and operate from ordinary utility supplies and have fully adjustable fogging output capability.

- **HRSM™** Compact, powerful, and built like a tank, with pivoting fogging head can deliver high quality fog anywhere you need it,
- **Turbo XE Fans™** bring all the power with added versatility and minimal investment. Humidifies up to 40,000 cu. ft.,
- **Aquafog® 400™** brings advanced fine-mist fogging to the small winery, with quiet hanging units for areas up to 3,000 cu. ft.

Discover the practical way of humidifying your barrel rooms with Aquafog®, the industry leader in centrifugal atomizers for over 18 years. Made in U.S.A.

For more information, contact:
Jaybird Manufacturing, Inc.
2595-B Clyde Ave., State College, PA 16801
tel: 888/889-4407; fax: 814/235-1827
e-mail: info@jaybird-mfg.com
website: www.jaybird-mfg.com

PLEASE SEE JAYBIRD MANUFACTURING, INC. AD, PAGE 58.

Vinovation, Inc.

Vinovation, Inc. has grown since 1992 into the largest and most diverse technology provider in the U.S. wine industry. In 2004, it reorganized its enterprises and strategic partnerships into a coalition of autonomous entities co-marketing as the GrapeCraft Partners Alliance, which together provides the world's most advanced package of services and equipment solutions.

Drop by and crack the quality code: how to fine-tune alcohol levels (reverse osmosis), how to save 90% of energy costs for cold stabilization (electrodialysis), how to turn press wine into a high-value asset (ultrafiltration). Turnkey installation and support packages are a specialty. Discuss your 2005 needs with Vinovation.

Pennies saved in investment can cost many dollars of inconvenience. If you're ready to move beyond troublesome stripped-down experimental oxygenation prototypes, OenoDev USA, subsidiary of the world leader in oxygen applications, offers Inter-Ox, the first fully-integrated professional system for all your O_2 requirements. Internet-based control panel displays treatment history and enables adjustment and troubleshooting from any location — even your pocket PC!

Oxygenation is one of the best bargains of any winery investment. "It makes good sense to install the best."

For more information, contact:
Vinovation, Inc.
1446 Industrial Ave., Sebastopol, CA 95472
tel: 707/824-7900; fax: 707/824-7905
e-mail: info@vinovation.com
website: www.vinovation.com

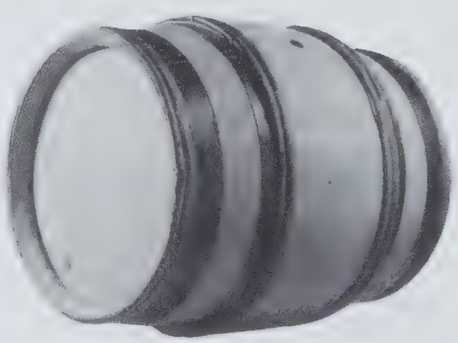
Tonnellerie Sirugue

Tonnellerie Sirugue is a family cooperage established in 1903 in Nuits Saint Georges, Burgundy. Sirugue's barrels were among the first French oak barrels to be imported to the U.S. for fine wine ageing in the late 1950s and 1960s.

Today, Sirugue focuses on wood selection, which is the basis of the cooperage's tasty barrels. Sirugue's wood is selected exclusively from French oak forests in the Allier, Nevers, Chatillon, and Vosges regions. The staves are naturally air-dried in Burgundy for a minimum of 24 months. A 36-month, air-dried program is available by reservation.

Sirugue produces Burgundy Traditional, Burgundy Export (228L), and Bordeaux Export barrels (225L).

Aside from its traditional house toast, Sirugue has worked intensively to achieve different toasting levels tailored to each customer's individual needs and style demands.



Sirugue's goal is a seamless integration of fruit and oak. Its barrels can be sweet, spicy, subtle, and elegant; they enhance a wine's fruit characters and flavors; they lift the fruit, frame it, and make a star out of it.

For more information, contact:
Tonnellerie Sirugue
Francoise Gouges-Guberman
2343 33rd St., Santa Monica, CA 90405
tel: 310/452-8147, cell: 310/403-8398
fax: 310/452-7847
e-mail: sirugueusa@earthlink.net

Skolnik Industries, Inc.

Skolnik stainless steel cooperage is designed to meet the special needs of winemakers in all stages of fermentation, maturation, and storage of fine wines. Skolnik has a long and proud tradition of providing leading winemakers with stainless steel drums of high quality, durability, and design.

SKOLNIK INDUSTRIES, INC.
MANUFACTURERS OF STAINLESS STEEL BARRELS

Skolnik's wine industry customers look to stainless steel cooperage to supplement oak barrels in key stages of the winemaking process. Stainless steel offers unique and unsurpassed qualities for preserving product integrity and purity — important considerations for why stainless is a key tool for winemakers.

Stainless steel cooperage is:
- Versatile and adaptable to many uses,
- Ready for use after being sterilized,
- Cost-effective and long-lasting,
- Predictable, reusable, and easy-to-clean,
- Virtually maintenance-free,
- Available in sizes from 5 to 55 gallons.

Skolnik is a full-service manufacturer of steel containers and accessories. Every Skolnik container is thicker, heavier, and stronger than industry standards — a commitment made to customers for more than 75 years.

For more information, contact:
Skolnik Industries, Inc.
Jason Snow
4900 S Kilbourn Ave., Chicago, IL 60632
tel: 800/441-8780; fax: 773/735-7257
e-mail: jason@skolnik.com
website: www.skolnik.com

PLEASE SEE SKOLNIK INDUSTRIES' AD, PAGE 78.

RLS Equipment Co., Inc.

RLS Equipment Company, Inc., has provided wineries with quality equipment and service for more than 40 years. As agent for Kiesel, Magitec, Pera, Strassburger, and Moeschle, RLS can supply complete crushing and pressing facilities.

Kiesel progressive-cavity pumps are available in both hopper and in-line styles from 1,000 liters per hour to more than 200+ ton per hour (tph). The unique Kiesel "corrugated" tube-in-tube heat exchangers can process from hundreds to thousands of gallons per hour.

Pera membrane presses are available from 30hl to 480hl with touch-screen PLC controls. Pera's H-Series stemmer/crushers range from 4tph to 100+tph with a punched-hole basket design.

Moeschle cylindrical and rectangular stainless steel tanks are custom-designed for specific customer requirements.

Strassburger offers high-quality plate/frame, and lees filters. Stainless steel construction with either S/S or noryl plates are durable and easy to clean. A wide variety of filter pads are available.

Magitec stemmer/crushers are available from 2.5 tph to 60+ tph with Magitec's unique square-hole basket. Magitec now offers a variable-speed, double-driving system (basket/beater bar) on smaller units and split machines with vibrator sorting tables between stemming and crushing operations.

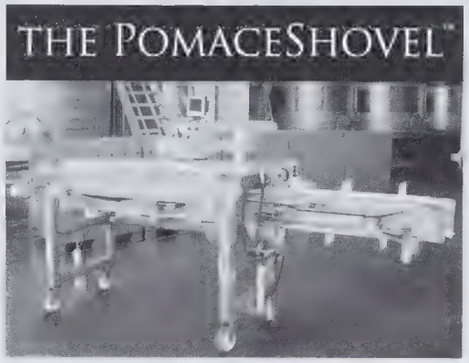
RLS offers domestically produced replacement membranes for most presses and a used- equipment listing.

For more information, contact:
RLS Equipment Co., Inc.
1017 White Horse Pike
Egg Harbor, NJ 08215
tel: 609/965-0074 or
West Coast tel: 800/527-0197
fax: 609/965-2509
e-mail: rls.equip@worldnet.att.net
website: www.rlsequipment.com

PLEASE SEE RLS AD, PAGE 83.

Tekanis, Inc.

The PomaceShovel is a revolutionary invention that provides a zero-tank entry method for gently, safely, and quickly removing grape pomace after fermentation.



Using patent-pending technology, the PomaceShovel gently sweeps pomace out of the tank. This low-shear process, equivalent to hand shoveling, does not degrade the pomace quality. Faster than hand shoveling, it can clean a 50-ton fermenter in less than two hours. Both the safety and speed of this machine offer a potential reduction in insurance and labor costs.

The PomaceShovel is reconfigurable for six-foot to wider than 12-foot diameter tanks, and is PLC safety-controlled by a single operator. It features stainless steel construction, an optional wireless video LCD monitor, a 480 volt 3-phase system, a 15hp food grade hydraulic system, and is heavy duty-rated for continuous use.

The PomaceShovel is easily maneuverable, operates quietly, and is easy to use and wash down.

Tekanis, Inc., founded by Dave Soberanis in 1995, utilizes creative inventiveness to problem-solve on behalf of companies in need of difficult solutions. Tekanis's latest product, a stopcock valve seal, stops leaking sample valves.

PomaceShovel orders are being taken for the 2005 fermentation season.

For more information, contact:
Tekanis, Inc.
PO Box 628, Hopland, CA 95449
tel: 707/391-8567
e-mail: dsobes@tekanis.com
website: www.tekanis.com

PLEASE SEE TEKANIS AD, PAGE 20.

Tonnellerie Bel Air

Tonnellerie Bel Air's unique system of tasting oak, tree by tree, places Bel Air among the top-tier of innovative, artisanal coopers. Located near Bordeaux, Tonnellerie Bel Air produces a range of competitively-priced Bordeaux- and Burgundy-style barrels using 100% French oak.

Recognizing that every tree differs according to its immediate growing environment, Bel Air has developed a detailed protocol of blind tasting stavewood through a water infusion process in order to assess variation of the wood's character. This procedure is employed on a monthly basis throughout the wood aging period to determine, on a sensory level, the optimum aging time.

Once properly seasoned, the stavewood is again tasted to define an oak profile and to categorize the wood, primarily according to its tannin structure, flavor characteristics, and the volume and texture it may offer a wine.

Barrels are customized for each client by focusing on the winemaker's desired results and by understanding how oak may influence the wine's characteristics. Being a small scale operation, it is the cooperage's goal to define oak blends and toast levels to suit the wine's structure and customer's aims. Barrel consistency, from year to year, runs high through Tonnellerie Bel Air's dedication to the principles of its oak tasting method in tandem with the quality service offered to its customers.

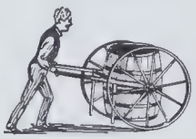
For more information, please contact:
Tonnellerie Bel Air
Arminée Chahbazian, U.S. Representative
364 College Ave., Angwin, CA 94508
tel: 707/965-2119; fax: 707/965-2923
e-mail: ac@arminee.com

PLEASE SEE TONNELLERIE BEL AIR AD, PAGE 97.

Bouchard Cooperages

Bouchard Cooperages is a barrel brokerage representing:

Keystone Cooperage (Jefferson, PA) produces a maximum of 7,000 barrels per year of ultra-premium Appalachia forest American oak barrels.



Les Tonnelleries de Bourgogne, (Damy — Meursault & Billon — Beaune) has provided barrels and puncheons to American producers of Chardonnay and Pinot Noir for more than 20 years.

Vicard Tonnelleries (Cognac) is a 100% family-owned and operated company, ISO 9002-certified for barrel fabrication, incorporating the latest technology to control the heating process with age-old tradition to produce barrels, puncheons, and tanks.

Tonnellerie Lafitte (Cognac) longstanding American and Hungarian oak "brand" of Vicard will now be labeled under the Vicard Tonnelleries name.

Tonnellerie Cadus (Ladoix-Serigny) is a partnership formed by Maison Louis Jadot of Burgundy, Tonnellerie Vicard, and Vincent Bouchard to produce ultra-premium barrels from three-year air-dried wood.

Arôbis (Gagnac Sur Cere) is a premium manufacturer of French oak powders, chips, and cubes, made from cooperage-grade oak that has been air-dried onsite, with no artificial kiln drying.

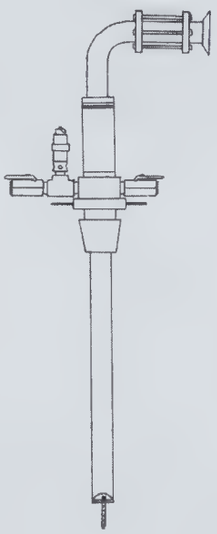
In partnership with the above coopers, Bouchard Cooperages has commissioned an analytical survey of barrels produced. The primary goal is to determine whether "cooper style" can be graphically demonstrated. Please visit the company's website, www.bouchardcooperages.com, for further information.

For more information, contact:
Bouchard Cooperages
743 Wilson St., Napa, CA 94559
tel: 707/257-3582; fax: 707/254-0852
e-mail: office@bouchardcooperages.com
website: bouchardcooperages.com

PLEASE SEE BOUCHARD COOPERAGES AD, PAGE 53.

Cuesta Equipment

Cuesta Equipment offers wineries a full line of supplies and production equipment. After 20 years of serving Central Coast wineries, a new location has been opened in Napa. A leader in supplying industrial and construction products, Cuesta Equipment offers a diverse inventory and excellent service, critical to your success. Quality products are offered at competitive prices to keep your operations performing most effectively.



Now available are: custom or standard stainless steel fittings, butterfly and ball valves, wine hoses, sight glasses, wine thieves, spray balls, diaphragm pumps, gaskets, hygienic shovels, wine chemicals, and Kärcher and Epps pressure washers (a stainless steel washer line ideal for moist environments). Cuesta Equipment also custom-builds innovative assessories perfect for winery production, such as Cuesta Equipment's "Jumbo Giant" (see photo).

The "Jumbo Giant" was designed using 1½-inch tube, to gently move wine, keeping agitation and air exposure to a minimum, making this an excellent racking tool. Also custom-built are punchdown tools, barrel mixers, keg carts, pump carts, tank and barrel washers, racking arms, and wands.

Cuesta Equipment wants to be the one source for all your wine industry needs, and is committed to provide customers with outstanding support and service.

For more information, contact:
Cuesta Equipment
4086 Byway East, Napa, CA 94558
tel: 707/254-8380, or toll free: 800/549-9000
website: www.cuestaequipment.com

KLR Machines, Inc.

KLR Machines, long known for the Bucher presses, and the Delta line of destemmers, has expanded their offerings of processing equipment to include the JLB line of basket presses (see cover photo) in three sizes: 5, 12, and 20 HI, to fit any winemaker's needs. Equipped with automatic programming, the JLB utilizes the latest PLC technology.

In 2003, KLR introduced the Mercier-Sanchez line of sorting belts and vibrating tables, giving a discriminating winemaker full optimization in the initial grape selection process.

The Delta E-1 destemmer, newest model in the Delta line is rated at 3 to 5 tons per hour, and continues to grow in popularity. To discuss these and other KLR products, stop by and visit their Unified Symposium booth.

For more information, please contact:
KLR Machines, Inc.
350 Morris St., Ste. E, Sebastopol, CA 95472
tel: 707/823-2883; fax: 707/823-6954
e-mail: KLRmach@pacbell.net

PLEASE SEE KLR MACHINES AD, PAGE 87.

Gamajet Cleaning Systems, Inc.

The new Gamajet **All-In-One Cleaning Machine** provides an innovative departure from the traditional necessity of moving and rotating barrels for cleaning. By combining high performance impingement cleaning with integrated vacuum extraction, the **All-In-One** allows barrels to be easily cleaned and emptied in place, with barrels in an upright position.

The **All-In-One** features the same technology and performance as the Gamajet E-Z7 Barrel Blaster while, at the same time, its integrated vacuum extractor will empty barrels in less than two minutes. The lightweight, handheld machine operates at flow rates as low as 3 gpm, and its unique design directs the majority of its flow to cleaning — not powering the unit itself. With a single insertion of the easily handled unit, 100% cleaning, along with complete liquid extraction, is assured.

The **All-In-One** is the featured attraction of the new Gamajet Roadshow, a traveling exhibition highlighting the newest barrel cleaning technology. It incorporates a water heater, pump, vacuum unit, and ancillary equipment, including barrels, for the on-site demonstration of all Gamajet's barrel cleaning equipment. The Roadshow will be traveling throughout the west coast and is available for FREE, no-obligation demonstrations upon request. Call 610-408-9940 to schedule a visit.

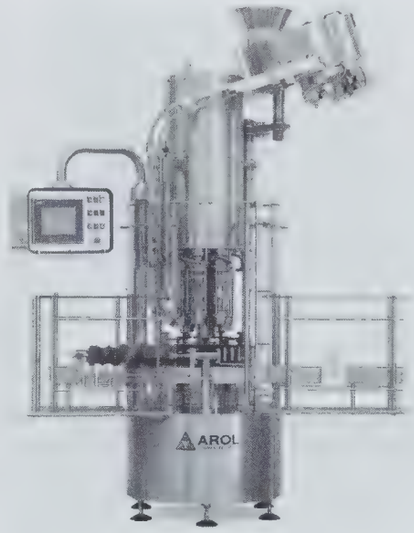
For more information, contact:
Gamajet Cleaning Systems, Inc.
PO Box 626, Devault, PA 19432
tel: 610/408-9940; fax: 610/408-9945
e-mail: sales@gamajet.com
website: www.gamajet.com

PLEASE SEE GAMAJET AD, PAGE 22.

AROL USA Closure Systems

A major bottling innovation, the AROL EURO VAC capper is the state-of-the-art in application of aluminum ROPP closures, including the 30mm x 60mm long skirted wine cap. The new EURO VAC uses a patented process that draws a vacuum on the headspace of the bottle prior to rolling the threads, thereby providing a vacuum atmosphere under a conventional aluminum ROPP cap. A worldwide breakthrough offering a reliable solution for decreasing the problem of oxidation of wine in glass bottles.

The ROPP cap is picked-off by the bottleneck as the bottle moves into the capping carousel and is lifted by pistons until the bottle enters the vacuum bell. Then, a vacuum pump is activated, which creates a vacuum inside the bottleneck. At this point, the AISI 304 stainless steel SSC head threads an ROPP cap.



Besides the patented vacuum in the headspace innovation, this machine is designed with a unique and creative round structure. Not only is its round frame aesthetically appealing, but its shape provides complete accessibility for maintenance and changeover.

For more information, contact:
AROL USA, Inc.
Division of Angelus Sanitary Can Machine Co.
450 Satellite Blvd. NE, Ste. D
Suwanee, GA 30024
tel: 678/318-1290; fax: 678/318-1296
e-mail: salesusa@arol.com
website: www.arol.com

PLEASE SEE AROL USA AD, PAGE 32.

United Barrels

Harvest 2004 brought tremendous success to our venture with Balkan Oak, a premium Bulgarian cooperage since 1870. In the last 10 years, the Nestroff family has invested heavily to replenish wood stocks and re-enter the export market with top-quality craftsmanship. The cooperage's current markets include France, Italy, Greece, and Germany. Quantities will double but remain limited for 2005.

The French oak cooperage Tonnellerie Chalufour has aggressively revamped production procedures, emphasizing technical soundness. In addition to its trademark Chardonnay and Syrah barrels, Chalufour has introduced a new "long toast" in which barrels spend 20 minutes longer on the fire at low temperatures.

Tonnellerie Allary continues to impress new customers with its ultra-traditional Bordeaux-varietal barrels using only hand-split, two-year, air-dried stavewood from the same five suppliers it's worked with for 50 years. This ensures ultra-tight grain and consistent toasty-caramel aromas so prized in long barrel-aged wines.

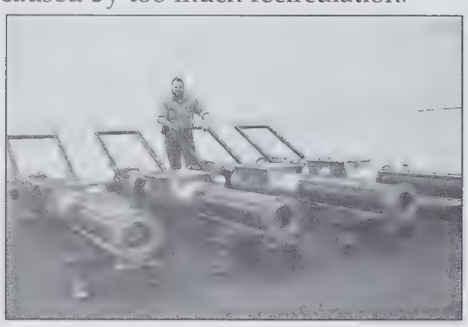
Moxon Timbers offers an ever-increasing selection of tank-stave systems, chips, dominos, and barrel inserts that bring treasured roasted aromas into the reach of not only major production facilities, but of small and medium-size wineries at very favorable pricing.

For more information, contact:
United Barrels
PO Box 178, Napa, CA 94559
tel: 707/258-0795; fax: 707/259-5324
e-mail: scott_ub@napanet.net

SEEPEX, INC.

seepex, Inc. offers a variety of pumps for the wine and juice processing industries. Open hopper pumps can be fabricated with hoppers made to the user's dimensional requirements and can be fitted on carts for portability and ease of cleaning. Pumps are available with complete control packages and options such as TSE run-dry protection and a retensioning device to adjust the stator for wear.

seepex BT pumps have a unique induction system that ensures positive berry and must feed into the pumping elements, with capacities to 1,300 GPM. This improves efficiency, lowers operating speeds for longer component life, and reduces fruit damage caused by too much recirculation.



Gentle handling of the fruit is especially important for winemakers where it is desirable to ferment the entire grapes rather than only the juice. Degradation of skins from rough product handling may result in extra chemicals being released during fermentation, giving undesirable characteristics to the end wine.

Pumps can be constructed to meet FDA requirements.

Pumps and parts are stocked in the **seepex** warehouse and by **seepex** distributors.

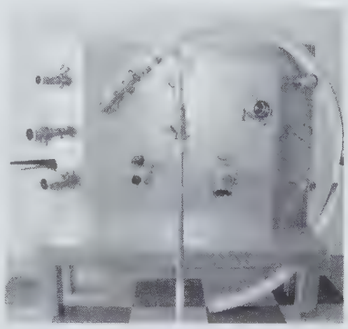
For more information contact:
seepex, Inc.
511 Speedway Dr., Enon, OH 45323
tel: 937/864-7150, ext. 117
e-mail: sales@seepex.net
website: www.seepex.com.

POWER INDUSTRIES

Power Industries carries a complete line of winery-related industrial products to meet the challenging needs of the wine industry.

When it comes to vineyard equipment maintenance, Power Industries stocks components used in spray rigs, disking equipment, mechanical harvesters, and the like. Qualified professionals are on staff to assist clients in troubleshooting hydraulic and mechanical systems, and to then make recommendations to solve the problem.

To support the crushing process, Power Industries maintains a wide variety of bearings and power transmission products. Material handling products such as; gear reducers, electric motors, screw conveyors, and variable-speed controllers are readily available.



Power Industries has been a pioneer in the development of specialized hose products for wine processing. Because of strong alliances with hose manufacturers, customized products can be developed to meet the specific needs of an individual winery. Hose assemblies for suction, wine transfer, and washdown are routine tasks at Power Industries.

In addition, bottling line accessories such as table-top conveyor chains, support railing, and air-preparation components round out a diverse product offering.

For more information, contact:
Power Industries
520 Barham Ave., Santa Rosa, CA 95404
tel: 707/545-7904; fax 707/541-2211
e-mail: sales@powerindustries.com
website: www.powerindustries.com
Napa
926 Kaiser Rd., Napa, CA 94558
tel: 707/252-7333; fax 707/257-8547

PLEASE SEE POWER INDUSTRIES' AD, PAGE 24.

COMPOSITE TECHNOLOGIES CORP.

The THERMOMASS® Building Insulation System is a patented connector and insulation system for constructing insulated concrete sandwich walls. At the heart of the system is a continuous fiber composite connector, which structurally ties the three layers of the wall together — two layers of concrete, and the middle layer of extruded Dow Styrofoam® insulation. The non-conductive, chemically-resistant, fiber composite connector creates an uninterrupted envelope of insulation throughout the exterior walls of a building. This produces a highly energy-efficient building system that is virtually maintenance-free and has the ability to not only resist mold, but stand up to fire and earthquakes.

Maintaining a steady temperature and a controlled humidity level are critical factors in wine storage. Insulated panels utilizing THERMOMASS® help winemakers create "above ground caves," thus giving them controlled, stable environments in the winery. Integrally insulated sandwich walls accomplish this by taking advantage of the "thermal mass" effect. "Thermal mass" is the ability of concrete sandwich panels to store BTUs and hold interior temperatures steady while external temperatures vary. Because energy will be stored within the walls, extreme temperature fluctuations that are inherent to low mass buildings will be eliminated.

THERMOMASS®
BUILDING INSULATION SYSTEMS

For more information, contact:
Composite Technologies Corporation
100 Technology Dr., Boone, IA 50036
tel: 800/232-1748; fax: 515/433-6088
e-mail: tstecker@thermomass.com
website: www.thermomass.com

PLEASE SEE COMPOSITE TECHNOLOGIES' AD, PAGE 93.

Expansion at Leonetti

Continued from page 93

"creeper" can be used to access all parts of the chase for inspection, repair, or modifications of utility and process piping. An opening at one end of the chase allows for any additional piping that might be required in the future.

A half-ton capacity hoist was originally provided to lower barrels down into the cellar from the delivery area. It was designed to accommodate puncheons. The use of 800-gallon upright ovals was never anticipated. There was concern that the additional load might deform the roof structure. However, after consultation with the structural engineer, it was determined that only minor reinforcement would be required to the support beam. Luckily, the ovals fit through the double doors — with less than one inch to spare.

Under the canopy

While rain during harvest is seldom a problem in Walla Walla, shade is at a premium. A large canopy provides sun protection for both crush pit and press area. Grapes arrive in custom, stainless steel, ¾-ton bins that are carefully emptied into the destemmer hopper by forklift. The Delta E-2 destemmer feeds a must pump that delivers the must through permanent stainless steel piping directly to fermentors located just inside the building. Stems are transferred to empty bins by conveyor.

The "pit" design is for convenience rather than any desire to achieve gravity flow. Gary believes that his red wines (Cabernet Sauvignon, Merlot, and Sangiovese) benefit from being "roughed-up" a bit. The press is moved outside when needed and is filled by forklift. A hopper, complete with its own catwalk, is suspended from the canopy and can be lowered into position with a small hoist.

Concrete tilt-up panels with integral color and careful detailing provide character and thermal advantages. Custom wood doors are framed by raised "trim" formed into the concrete panel. Wood soffits and beam ends provide warmth and scale.

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Make every year a very good year with the THERMOMASS® Building Insulation System

Temperature management issues are faced every day in the wine industry. In fact, just a few degrees of temperature fluctuation can make or break an entire bottling. Wine facilities insulated with the THERMOMASS® Building Insulation System take the these temperature fluctuation issues out of the picture by creating an "above ground cave," thereby offering a precisely controlled environment.

Wineries that have taken advantage of the benefits of THERMOMASS® include industry leaders such as: Mondavi, Leonetti, Beaulieu and Clos du Bois.

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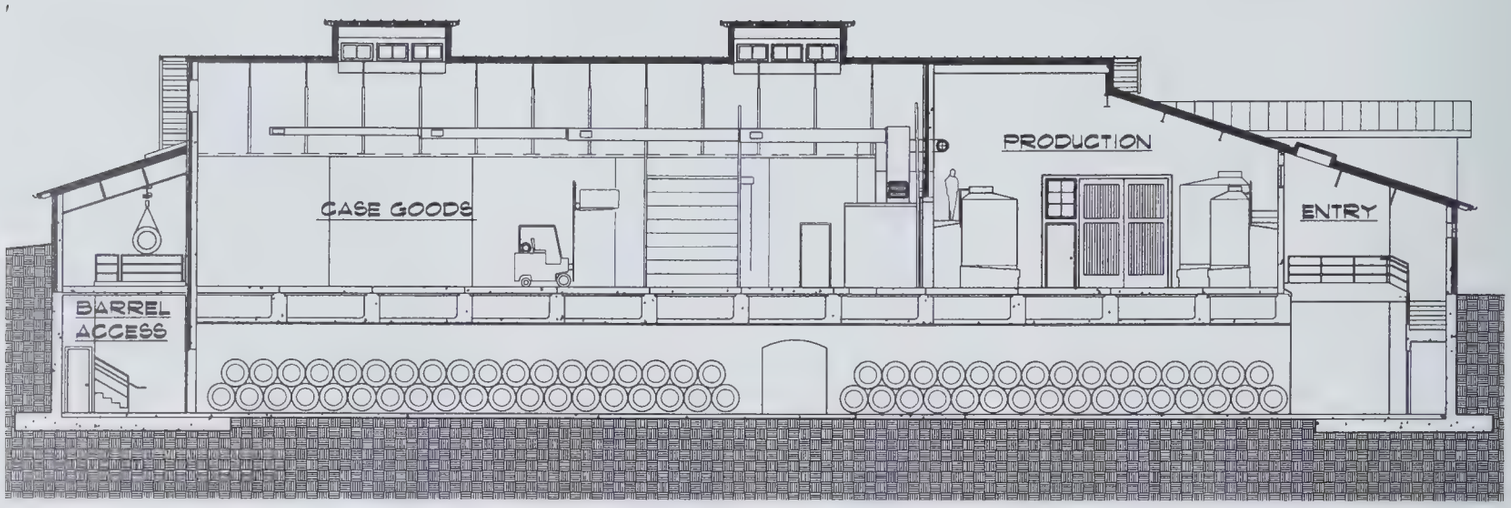

Longitudinal cross section: "lean-to" portion (left) houses fire stair and barrel hoist. Roof monitors let natural light into the case goods and bottling area while skylights above two-story entry vestibule provide daylight into barrel cellars.

Simple systems

Temperature swings in Walla Walla can be huge. Winter night temperatures have been recorded as low as 18°F below zero and summer highs of 114°F. Good insulation values in building materials are critical.

Insulated tilt-up concrete sandwich panels utilizing the THERMOMASS® Building Insulation System were used to form exterior walls. The panels are 14 inches thick overall with 7½ inches of interior structural concrete, four inches of extruded Dow Styrofoam foam insulation, and 2½ inches of "architectural" concrete. The three layers are held together by high strength, non-conductive, fiber-composite connectors on a 16-inch grid. The connectors eliminate thermal bridging and enable each wythe (one side of a double wall) of concrete to operate independently of the other. The THERMOMASS® wall has an approximate performance R-value of 30.

The roof has seven inches of rigid insulation (insulation value of approximately R-50), and the roll-up and swinging doors between the fermentation and case goods storage are also insulated.

THERMOMASS® insulated panels create a controlled environment in the winery by taking full advantage of the "thermal mass" or "thermal lag" effect (the ability of dense materials to retain and slowly release daytime heat and nighttime cooling). They help maintain interior temperatures even as external temperatures vary.

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Bitard Since 1896
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Bulldog Manufacturing
P.O. Box 356 San Luis Obispo, CA 93406
Ph 805.541.3083 Fax 805.544.6181
www.bulldogmfg.com
email: pups@bulldogmfg.com

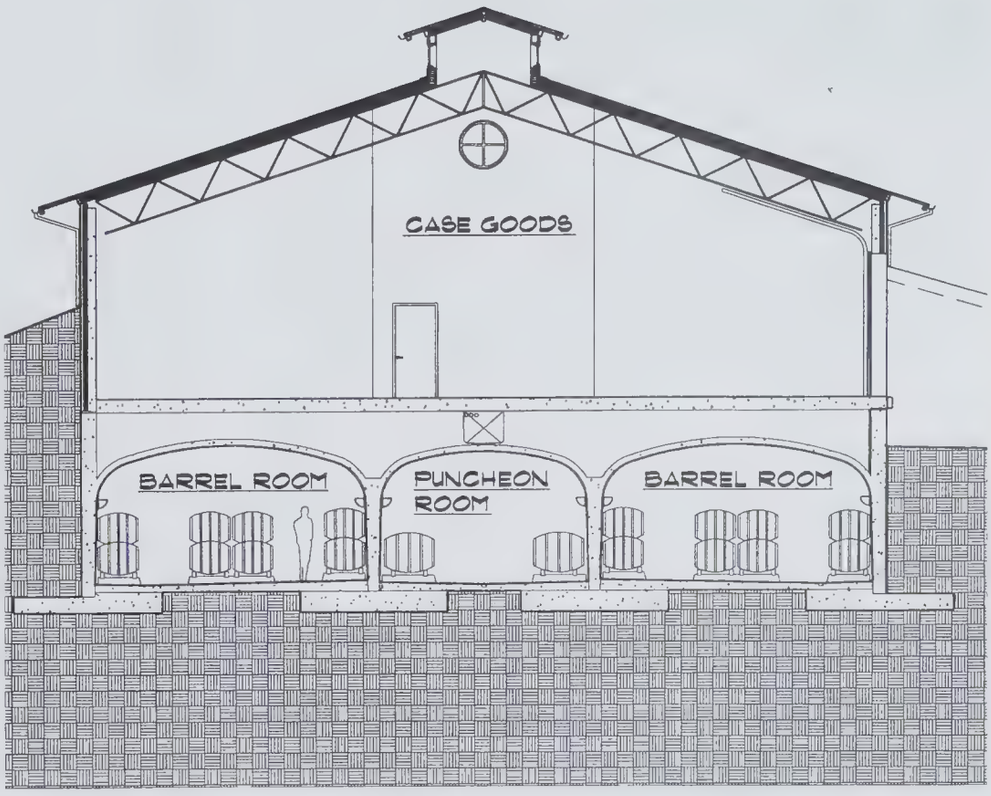
Peak heating and cooling loads can be shifted to off-peak hours. Because energy will be stored within the walls, temperature variation that is inherent to low mass buildings is eliminated.

Gary Figgins expressed the desire to avoid complex mechanical systems. Because of significant insulation values and the fact that the interior mass of concrete also reduces internal loads on the facility's condensing units, all the heating and cooling is provided with two simple-to-operate residential-style heat pumps. The only exception is the laboratory, which because of its location, requires a separate through-the-wall unit.

Cooling of the red fermentors is achieved by running well water through the tank jackets. Once used, the cooling water is recycled for landscape irrigation. The jackets can also be manually switched over to heating. A small boiler provides domestic hot water.

CO_2 is evacuated from the fermentation room by simply opening two large doors at either end of the room. Mechanical temperature or humidity control of the cellars has not been necessary. A multi-speed fan assures that fresh air can continually circulate through the cellar, with the ability to: 1) provide night cooling, 2) control humidity, and 3) quickly evacuate CO_2 or SO_2 if required.

Humidity in the cellars has reached 98% in the past. Running the fan can bring it down relatively quickly to the 85% that Figgins considers ideal.



Cross section shows space between floors that provides access to all utility piping. A narrow barrel room, designed for puncheons, runs down the center and is flanked by two wider rooms for 225L barrels.

Non-toxic choices

Untreated concrete deteriorates quickly when exposed to the acids in wine. Prior to this project, our experiences with epoxy finishes had been mixed. Various types of bonding problems were common, requiring anything from minor touch-up to complete resurfacing. Based on Figgins's positive experience in his original winery building, a water-based epoxy (Aquapon® by Pittsburgh Paint) was applied to both the cellar and fermentation room floors. One benefit is that it is low in volatile organic compounds. Another plus is that it can be touched up by the owner without special protective measures and without risk to wine that is ageing in the building.

As with all epoxies, surface preparation is critical. The concrete must be well-cured and acid-washed or bead-blasted. Because of Walla Walla's dry climate, the floor dries quickly. No anti-skid grit was deemed necessary. Figgins has found that as long as workers wear non-skid (rather than flat-soled) shoes they've had no problem with slippery floors.

Because of the recent history in Bordeaux of taint problems traced to the use of treated wood, use of pressure-treated wood was avoided throughout the entire building. Where rot-resistant wood was required by code, naturally rot-resistant cedar or redwood was substituted.

Finishing touches

To avoid an industrial look, I encouraged Gary to use integrally colored concrete on the outside of the tilt-up wall panels. Several samples were prepared for Figgins' review. They came out so well that Figgins decided to use dyed concrete on everything from the cellars to the tank "housekeeping" pads (photos 2, 6). A color that closely resembles the local soil was selected. With a clear sealer applied, it has taken on a luminous marble-like patina.

Completed in time for 2000 harvest, the new facility has left Gary and Chris saying there is little they would change. This project was the result of a successful collaboration between an owner focused on quality, an experienced design team willing to explore new approaches, and fine local craftsmen. ■

Laurence Ferar is the principal architect and landscape architect with Laurence Ferar and Associates, Inc., a Portland, OR firm established in 1983 that specializes in winery design. Tel. 503-241-5447

PERSONNEL POINT OF VIEW *by Anne Heron*

Empowering employees through goal-setting

George took me aside during the break in our planning session. "I'm excited about where we're going!" he said. "We've got some hefty goals to accomplish this year. How am I going to get people involved? I can't do this all by myself."

As the winemaker, George is on the winery's executive team, which had just spent the day discussing plans for the future. Part of the team's strategy includes implementing sophisticated business practices and more consistent methods in winemaking.

As part of this strategy, George was charged with documenting production processes and using this documentation to create a procedures manual during the upcoming year.

The manual will be used as a training guide for new employees and a tool to ensure consistency in production. It will also simplify the data-gathering needed for analysis of production costs.

"I'd really like my new assistant winemaker, Judy, to take on this documentation task," said George. "It would be a great way for her to learn how we do things. From what I've seen so far, she's very well organized. I think she's got what it takes to pull this off, but I want to do my part to support her." George then asked me to walk him through some points that would help him discuss this goal with her to ensure that she'd be successful.

"WHAT IS THE GOAL? WHAT SPECIFICALLY MUST BE ACCOMPLISHED AND BY WHEN?" I asked. Defining the end result as clearly as possible is the place to start.

"Ah, yes," said George. "I remember the acronym. I should set a S.M.A.R.T. goal for her — Specific, Measurable, Achievable, Relevant, and Time-oriented. That shouldn't be too hard, based on the discussion we had at the planning meeting.

"The goal could be something like, 'Develop a procedures manual that describes all production activities, and complete it by year end.' That's pretty specific and measurable … and it's got a date attached. It's a good start."

I agreed. However, when it comes down to describing the end result to Judy, it would be helpful for George to be more specific and thorough. He could describe his expectations for such things as which production activities should be included, what level of detail to document, and what the format should be.

As a useful "reality check," he could discuss what the outcome will look like once it is achieved. George and Judy could go over the purpose of the procedures manual, how it will be used, who the target audience is, and other useful details.

They could also visualize how training cellar workers or lab personnel would be done using the new documentation. They could anticipate what errors might be eliminated or what data would be available once procedures are standardized.

These discussions would help Judy understand the intent of the project, and could also help her make decisions about direction and scope as she works to achieve the goal.

"WHAT MAKES THIS GOAL RELEVANT? HOW DOES IT TIE TO BROADER DEPARTMENTAL OR WINERY GOALS?" George hadn't addressed the 'R' in his S.M.A.R.T. formula.

Explaining the impact of the goal — on the organization, the department, or the end product — is an important way to engage an employee and gain buy-in. It helps everyone understand why achieving the goal is worth the effort it will take.

George decided to give Judy an overview of the new direction the winery was taking in becoming more business-focused and the part that a comprehensive procedures manual could play in such an effort.

Being able to describe how the goal leads to broader corporate objectives will also help Judy gain support from others within the organization, along with the resources she will need.

"You might also want to consider how this goal is relevant to Judy herself," I suggested. "When an employee feels that there is a personal benefit to accomplishing a goal, it is more likely to get done successfully and with more enthusiasm."

George thought about that for a moment and explained that, from his viewpoint, this project would allow Judy to make a significant contribution to the organization. It would also provide an excellent way for her to learn how things were done at the winery — and perhaps even identify changes that would make it more efficient.

WHAT STEPS WILL WE TAKE TO ACHIEVE THIS GOAL? WHAT ACTION WILL BE TAKEN? BY WHEN? BY WHOM? The next step in the goal-setting discussion is to map out a general action plan. Often these action steps must be refined as you go along.

George was anxious to build an initial action plan with Judy. He wanted to ensure her success, and he was a bit concerned that since she was new to the organization, she might not know where to start. He had an idea that she could document procedures throughout the year, as she went through the annual winemaking cycle, but he was also concerned that this method might take too long. Perhaps she could begin by interviewing all the staff.

He was getting very caught up in figuring out the best way to approach the project, when suddenly he stopped short. "Oh my goodness," he cried. "I almost forgot. This is Judy's project, not mine!" We both laughed. "It's the toughest part of delegation — the letting go. I can describe the destination, but the path to get there? That's up to her. My role is to give support and guidance."

As George smiled and considered his "mentoring" role, we discussed several approaches to action planning. One method is to brainstorm all the possible tasks that need to be accomplished to meet the goal. This list can then be prioritized, based on timing and contingencies. The key is to iden-

tify which activity needs to be done first in order to do the next one.

Another way to determine action steps has been called the "Merlin Method," after the magician in the King Arthur legend who was said to live backwards. As the story goes, Merlin was born an old man and grew ever younger throughout his life. Using the Merlin Method, you start with the finished product and identify which task would have been completed just prior to the end, then just prior to that, and so on.

For example, George could imagine holding the finished manual, which would have been picked up from Kinko's. The step before that would have been giving his approval to the final draft, and before that he would have received input from the management team, and before that he would have reviewed drafts of each section, and before that ...

Whichever method is used to determine the action steps, they should be written down early on and serve as a living document that is reviewed on a regular basis. While it's been said that the way to success is to "Plan your work and work your plan," many of us don't take the time to plot our path. We also often have trouble ensuring that each step gets accomplished, especially when faced with the pressing demands of our day-to-day activities.

"WHAT RESOURCES (TIME, MONEY, COOPERATION WITH OTHER DEPARTMENTS) ARE NEEDED TO ACHIEVE THIS GOAL?" As George and Judy created her action plan, I recommended that they make a list of what tools, resources, and support will be required to complete each task. I also suggested that they identify the other individuals or departments that would be affected by the goal, and should thus be included in planning or decision-making.

Anticipating resource needs would help George determine where his support might be required during the project for such things as allocating budget dollars or staff time, running interference with obstacles that get in the way, or providing expertise.

"HOW AND WHEN WILL WE MONITOR PROGRESS?" The final point to consider is the process that will be used to track completion of the action plan. It is important to mark milestones and decision points. This will provide an opportunity to discuss any concerns that have come up, make any changes that are needed, or plan for the next steps.

How often should you check in? I recommend discussing progress on at least a monthly basis.

As we wrapped up our discussion, George felt he was ready for his conversation with Judy, so he scheduled it for the next day.

Three months later, George called me. "We're almost done with the project," he said, sounding very pleased. "Judy's done a great job. Our initial goal-setting discussion helped her build a plan, anticipate problems, and understand the importance of keeping people informed along the way. She's been so successful that she's looking to take on bigger projects next year!" ■

Anne Heron is a senior associate with The Personnel Perspective, a human resources consulting, training, and recruiting firm in Santa Rosa, CA. She has over 25 years of management and HR experience. Contact: 707/576-7653.

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Sustainable Winegrowing Practices

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the season. Of these growers, 76% drive their air blast sprayer 3.5 mph or slower and attain tractor speed and sprayer pressure prior to entering the tractor row. 37% train employees in proper equipment use and coverage parameters and verify spray coverage.

33. Buffer Zone — The vineyard is part of a larger ecosystem with other plant and animal communities in close proximity. These areas can be exposed to materials and practices used in a vineyard. Buffers are one way to help ensure that these materials and practices do not intrude into other ecosystems. 94% of growers establish reasonable buffer zones near sensitive areas and avoid applications when winds are blowing toward sensitive areas. 63% adjust the timing and within-field sequence to minimize human activity and disturbance of sensitive areas. 2% only meet the legal requirements of the pesticide label.

34. Spray Drift — When a decision is made to spray materials in a vineyard a grower must consider the possibility of drift. By minimizing drift, a grower is protecting the environmental quality of the area and public health, and also insuring the pesticide is targeted on vines for effective pest control. 87% of growers avoid any applications when the wind exceeds 7 mph or is less than 2 mph.

Low effective rates are used, and nozzles are selected and maintained to deliver the largest recommended droplets of uniform size. 73% shut off dusters and sprayers at the end of the tractor row near sensitive areas, and 18% use additional low-drift spray technology (such as low-drift sprayers, drift-reducing nozzles.) 10% do not exceed the legal wind limits by checking the labels for federal and state limits and by checking with the Agricultural Commissioner for additional county restrictions.

35. Pesticide Storage — Even when not being used, pesticides can still pose a potential liability if not properly stored. 21% of growers only order enough pesticide for each application to limit onsite storage. 45% of growers store dry pesticides above liquid ones, store them more than 300 feet from a well, have a storage area with an impermeable floor and sump to contain leaks, and only store undamaged containers. 21% of growers order enough pesticides for a season with no storage over the winter, and return unopened containers to the supplier, while the remaining 24% do store some pesticides over the winter. 18% follow the minimum legal requirements for pesticide storage.

36. Pesticide Mixing and Loading — The time of greatest exposure to pesticides is during mixing and loading of material. 84% of growers provide personal protective equipment (PPE) for all workers, and the water source for filling a sprayer has a double-check valve or a six-inch air gap. 65% maintain the loading/mixing area at least 30 feet from any well and have a berm around the well-head to prevent surface water from contaminating the well. 39% of growers use a separate water supply tank for pesticide mixing and maintain the mixing/loading area at least 100 feet from the well-head. 9% of growers follow the minimum legal requirements for use of PPE.

37. Pesticide Emergency Response Plan — If a spill incident occurs during pesticide mixing or loading, it is critical that the spill is properly handled and appropriate treatment is available. Having an emergency response plan is critical to preventing or minimizing human and environmental exposure. 64% of growers have an emergency response plan posted and spill clean-up, wash facilities, and first-aid equipment available. 50% train their workers to follow the plan. 10% of growers either have an emergency response plan posted or make spill clean-up and first-aid equipment available. 19% maintain the minimum legal requirements for a pesticide emergency response plan.

38. Restricted-Use Materials present the greatest threat to worker health and the environment. Pesticides with the highest risk are known as Category 1 materials. Other materials that pose a significant risk are known as restricted-use materials. 25% of growers never use Category 1 or restricted-use materials in a vineyard. 52% only use Category 1 and restricted-use materials in emergency situations, such as the introduction of an exotic pest. 11% of growers avoid the use of Category 1 and restricted-use materials in a vineyard. 8% use Category 1 and restricted-use materials whenever it is convenient.

Best Practices

Statewide Strengths: The majority of growers report practices that, in combination, constitute an excellent insect, mite, disease, weed, and vertebrate pest management program. The majority of growers also report implementing practices for using pesticides in an effective and safe manner, including calibrating and maintaining application equipment; applying for proper coverage; using buffer zones; and going beyond legal requirements to manage drift and reduce risks during storage, mixing, and loading.

Targets and Timelines

Statewide Opportunities for Improvements: There is an opportunity for the majority of growers to train vineyard employees to assist with insect and mite pest monitoring (criteria 6–9), improve weed monitoring protocols (criteria 6–20), and implement practices to increase vertebrate pest predators (criteria 6–29). Though the majority of growers report implementing best practices, there is an opportunity with the remaining minority of growers to improve pest management practices for most criteria.

The California Sustainable Winegrowing Alliance has set a desired goal of demonstrating improvement in pest management practices in California winegrape vineyards. By harvest 2009, CSWA will strive to improve winegrape growers' average pest management scores that are less than three on a scale of one (low) to four (high) by 20%. At the same time, CSWA anticipates that winegrowers whose scores are already three or above will demonstrate continuous improvement.

To reach these goals, CSWA needs partners to help fund education and outreach that will promote the understanding and adoption of sustainable practices, to host workshops, and to participate in other ways. If you are interested in improving pest management practices within the wine community, please contact info@sustainablewinegrowing.org. ■

Smart

Continued from page 74

found no improvement in wine quality, but this surely requires more work.

Conclusion

Our vineyards are going to warm up, and we should do something about it. Already we are growing many poorly suited varieties in hot climates, and this situation will worsen. More research is required into varieties suited to hotter climates and into the possible mitigation provided by vineyard cooling. ■

Dr Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Launceston, Tasmania in Australia. He is contactable by e-mail: vinedoctor@compuserve.com, and by telephone 00 61 418 656 480, or fax 00 61 3 6331 0849. Details of Dr Smart's business including his consulting schedule, educational wine tours and seminars are at his home page http://www.smartvit.com.au. He visits America frequently and his consulting schedule is arranged by Vinquiry in Windsor, CA, tel: 707/ 838-631 and http://www.vinquiry.com.

Wine International Wine Personality of the Year award to Dr. Richard Smart

Dr. Richard Smart received a *Wine International* Wine Personality of the Year (Innovation Award) in the December– 2004 edition of *Wine International* magazine (London, England).

"It is most unusual for a viticulturist to be recognized with an award such as this," says Smart. "Normally the accolades in the wine sector go to the winemakers, and those who manage vineyards are passed over, despite making significant contributions to wine quality — in my opinion arguably greater than those of the winemaker! I humbly accept this award and want to share it in spirit with the many viticulturists whose efforts pass unrewarded.

"I am further honored by being in the esteemed company of Hugh Johnson and Piero Antinori, fellow recipients of *Wine International's* 2004 Wine Personality of the Year."

In announcing the award to Dr. Smart, editor and wine judge Catharine Lowe said, "This is a huge accolade as you have been voted for by other highly-respected and eminent members of the wine trade."

The award is in recognition of Dr. Smart's impressive achievements in the world of wine and strengthens the notion that great wine is made by a team of people, from viticulturists to winemakers.

Wine International's website (www.-wineint.com) goes further: "The category acknowledges that, despite thousands of years of tradition, there is still room for improvement in the vineyard and the winery. Smart has worked for 40 years to improve vineyard management, and has written and co-written more than 200 publications, including the *Sunlight into Wine* about canopy management."

Dr. Smart, 'the flying vine doctor,' offers world-wide consultancy to clients in 22 countries, as well as touring and teaching in growing quality wine grapes. "I regard seeing the viticultural landscape around the world being changed by canopy management as my greatest personal achievement," says Smart.

His work as government viticulturist in the 1980s helped lay the foundation for New Zealand's globally-competitive wine industry. Smart is currently consulting for Gunns Tamar Ridge Wines in Tasmania (Australia); developing new and large-scale vineyards in several sites, including some which were located using his computer-based "homoclime searching." About 150 hectares of vineyards were planted in 2004, and these, along with those to be planted, will ultimately have a significant impact on the development of the Tasmanian wine industry. ■

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TWO VOLUMES

New edition of wine industry lab book

The book formerly known as *Techniques for Chemical Analysis and Quality Monitoring during Winemaking* has been updated and re-written in two volumes to better cover more wine laboratory content.

Chemical analysis of grapes and wine: techniques and concepts

The first volume is by Patrick Iland, Nick Bruer, Greg Edwards, Sue Weeks, and Eric Wilkes (academics, winemakers, laboratory supervisors, and consultants). Comprehensive, up-to-date coverage of the theory/practice of major chemical analyses of grapes/wine is available in 120 plastic-coated pages. A user-friendly, step-by-step approach details the procedure for each analysis method. Many practical clues are given in the 'Helpful hints' and 'Trouble-shooting/Source of errors' sections. This book is suitable for daily use in a wine laboratory, and a student training resource in wine courses.

Monitoring the winemaking process from grapes to wine: techniques and concepts

Volume II by Patrick Iland, Nick Bruer, Andrew Ewart, Andrew Markides, and John Sitters, provides coverage of concepts, tests, and techniques that winemakers use to monitor wine style/quality indicators throughout the winemaking process. The book includes techniques for tasting grapes, winemaking operations including fermentation concepts, additions, fining trials and stability tests, and sensory evaluation of wine. The 120-page plastic-coated book is suitable for daily use by winemakers.

■

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March 24, 2005

RAVE

Recent Advances in Viticulture & Enology

The Department of Viticulture & Enology will host an annual event on March 24 at UC Davis to focus on: "Effects of cropping level on vines and resultant wine composition." The results of several years of rigorous sensory analysis supporting the cropping level data will be presented. Concurrent with the lecture on the sensory impact of vegetal characteristics, the audience will able to taste and evaluate wines at various methoxypyrazine levels. In order to encourage interaction, there will only be a few presentations with more time given to each topic than in past events. Each attendee will receive a binder with related articles and information on the topics for reference. The sessions are designed to be interactive, with audience members encouraged to bring questions and/or items for discussion.

The enrollment fee of $200 includes a box lunch. To enroll, please call 800/752-0881, 530/757-8777 in Davis or Woodland; email aginfo@unex-mail.ucdavis.edu; or visit www.extension.ucdavis.edu/ winemaking.

Program Agenda

Retrospective — Yield and Wine Composition, Nick Dokoozlian, Vice President of Viticulture, E&J Gallo Winery

Measuring Quality — Effect of Yield on Methoxypyrazine Content in Cabernet Sauvignon, Sue Ebeler, Dept. of Viticulture & Enology, UC Davis

Can Yield Predict Winegrape Quality? Mechanisms of Vine Response, Mark Matthews, Dept. of Viticulture & Enology, UC Davis

The Connection from Vineyard Practices to Wine Composition and Wine Sensory: Impact of Yield on Perceived Methoxypyrazine Levels in Cabernet Sauvignon. (includes tasting), Jean Xavier Guinard, Dept. of Food Science, UC Davis

Artificial intelligence and the art of winegrowing — What vineyard parameters best predict resultant wine quality? David Block, Dept. of Viticulture & Enology, UC Davis

Using precision viticulture to optimize yield and winegrape quality, David Smart, Dept. of Viticulture & Enology, UC Davis

A Practical Look — Impact of water relations on winegrape yield parameters, Mike Anderson, Dept. of Viticulture & Enology, UC Davis

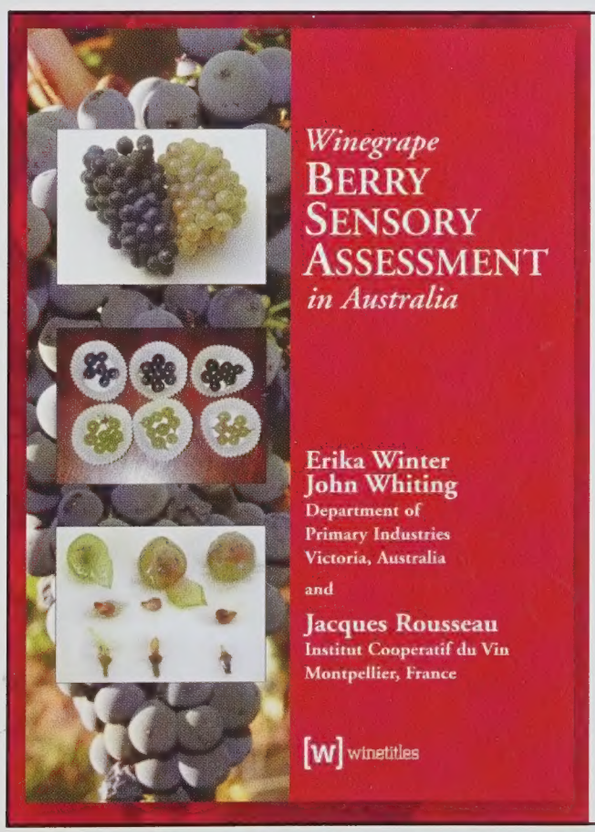
Hang Time — Effects of extended maturity on vine health, Andy Walker, Dept. of Viticulture & Enology, UC Davis

April 6–8, 2005

New York Wine Industry Workshop

Topics include: Preparing wines for bottling, Growing and making Lemberger wines, and TTB seminar.

For more information, call 315/787-2288 or visit: www.nysaes.cornell.edu/fst/faculty/henick/wiw/index.html



For grapegrowers and winemakers, this is a guide for assessing berries for ripeness and harvest scheduling.
It contains detailed instructions on how to examine berries before harvest, according to 20 standardized and industry-tested criteria, by judging stems, skins, pulp, and seeds. A 1 to 4 scoring system is employed which can be used in repeated assessments to build databases on varietal performance, and berry development over sites and years.

The aim of the book is to provide a basis for a uniform language on crucial berry attributes throughout the Australian wine industry.

The method was designed by the Institut Cooperatif du Vin in southern France and was adapted to Australian conditions by Erika Winter and John Whiting, together with an industry reference group.

It will change the way you look at your grapes, help you to understand how berry characteristics change, and encourage you to monitor, assess, and experiment.

For sale on ***PWV* Bookshelf** for $28.

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